Veterinary Elements

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SCIENCE WITH PRACTICE

Veterinary Elements

A MANUAL FOR
AGRICULTURAL STUDENTS AND STOCKMEN

BY

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WITH ILLUSTRATIONS

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PREFACE.

An experience as a student in animal husbandry in two agricultural colleges (Ont. Agl. Col., Guelph, Canada; Iowa Agl. Col., Ames, Iowa), leads me to believe that, in common with the veterinary works written for stockmen, the veterinary courses were far too technical, thus being a drudgery to the students and calculated to mystify rather than enlighten, due, I believe, to the idea that the agricultural student or stockman should get veterinary knowledge in the same form as the veterinary student, the difference being only one of degree. The demands of the Short Course in Agriculture in the University of Wisconsin would not allow of the use of technical terms or big words, or even a multiplicity of diseases, hard to distinguish between, with their attendant treatment. This book embodies in a simple form the lectures as delivered to Short Course students, the main object of the author being to fit the stockman so that he shall be to the veterinarian what the trained nurse is to the physician. The proper recruiting ground for veterinarians is from among the stockmen. To become so no one should attend a veterinary college having less than a three-year course. I have placed under contribution Hayes' Points of the Horse and his Veterinary Notes for Horseowners; Smith's Veterinary Physiology; Henry's Feeds and Feeding; and Fleming's Obstetrics; a perusal of any of those works will repay the reader.

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PREFACE TO THE SECOND EDITION.

The flattering reception accorded the first edition necessitated the early publication of a second edition. The work has been re-read, corrected and brought up-to-date, and includes several new illustrations. Heavy type has been used to draw attention to essentials. While packed in a small compass, it can be amplified by any instructor to meet the needs of his class. I am indebted to Capt. M. H. Hayes, F. R. C. V. S., Rugby, Eng., for suggestions and corrections, and to F. Torrance, B. A., D. V. S. (McGill) Winnipeg, Can., for his kindness in revising the work.

A. G. H.

Winnipeg, Can.

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ERRATA.

Page 245—In the illustration, the spavin is on the near leg, *not* the off one.

Chapter VIII, Part II, page 153, should be Chapter XIII.

CONTENTS.

Part I.—The Construction and Functions of the Animal Body.

Veterinary Elements.

PART I.

The Construction and Functions of the Animal Body.

CHAPTER I.

THE SKELETON.

Natural Science Study Essential. In First Principles of Agriculture we are told that agriculture may be divided into four general branches, one of which is Animal Industry (Husbandry). The same authority, when classifying the personal factors upon which success as an agriculturist depends, insists upon a knowledge of the natural sciences, not the least important of which is Animal Knowledge (**Zoology**). Such a deep study is zoology that specialists have divided it into branches, an elementary study of two of which (*physiology* and *pathology*) will constitute the subject matter of this book.

Physiology and its relative, **anatomy,** have to do with the functions and construction of organs of the animal body: **Pathology,** in the broad sense used here, has to do with mal-nutrition and disease, and their prevention. It may be accepted that, in order to be successful as a stockman, a knowledge however elementary of the anatomy and physiology of live stock is essential as on such knowledge is based not only the preservation of health

by avoiding overwork or idleness of various organs, but also the prevention of disease by preventing the inroad of germs. The possession of a knowledge of the construction of an animal (anatomy) is a valuable aid to enable us to classify that animal as to its fitness for the dairy or the block, the carriage or the lorry.

The Life Unit — the Cell. The animal body is a collection of small masses of protoplasm known as cells. Each cell has the property of nutrition (taking in food and using it to build up the body) and reproduction (propagating itself), and may be capable of motion. Protoplasm is made up of the elements carbon, nitrogen, oxygen, hydrogen, sulphur. *Cells collected together for special purposes form a tissue*, e. g., bone, muscle, nerve, vascular, etc. Through the union of cells we get nerves and capillaries, and from cell excretions we have built up connective tissues, bones and cartilage.

Definition of Anatomy. The study of the form and structure (conformation) of the animal body.

There are several kinds of anatomy, referring especially to the methods used and the object sought, e. g.:

Comparative Anatomy refers to the study of form and structure of not only the horse, but the cow, pig, dog, sheep, poultry and Man.

Histology is another division of anatomy, the study of which calls for the use of the microscope and consists of the study of tissues, such as skin, liver, bone, lung, etc. If the study is of diseased tissue, it is known as *Pathological or Morbid Anatomy.*

Surgical Anatomy is of value to the surgeon and does not concern the agricultural student.

For the agriculturist an elementary knowledge of comparative anatomy is essential, because owing to the differences in the construction of the various animals, such animals require different treatment in the way of feeding, watering, shoeing, and during sickness. By the study of anatomy we are enabled to map out the animal, and thus can locate a diseased part more readily.

The work of the anatomist may be compared to that of the architect, because in both cases the study of the framework is the basis for the study of the superstructure.

The animal may be briefly analyzed as a bony skeleton, covered outside by muscles and the skin, and containing inside that skeleton the various organs, such as the heart, lungs, liver, kidneys, stomach, intestines, reproductive organs and the nervous system.

The Skeleton. The framework is generally called the skeleton. It is made up principally of bones.

Bone is a hard, yellowish white, insensitive body made up of earthy and animal matter. The earthy matter is made up mainly of the following materials: Phosphate of lime, carbonate of lime, phosphate of magnesia, and soluble salts. The earthy and animal matters are in the healthy mature animal properly balanced, in the young animal, the animal matter is in excess, thus accounting for the small number of breaks (fractures) in young animals, and also for the rapidity with which such breakages are repaired. In old animals the earthy matter is in excess, consequently breakages (fractures) are more frequent and repair is slower than in the young animal.

Bone is the hardest of all the animal tissues, due to the presence of the earthy matter before mentioned, its

elasticity (the power of bending to a limited degree and of sustaining shocks) is due to the animal matter in it. Living bone is elastic, bluish white and insensitive. (It must not be forgotten that life exists in all the several parts as much as it does in the whole body, and that Death, or cessation of life, occurs when the functions of the various parts have ceased, and thus caused stoppage of the work of the body as a whole.) Bones not only form a framework, but owing to the fact that muscles are attached to them, also become levers and have to do with the movements of the animal.

Quality of Bone and Its Indications. The quality of the bone in an animal is of great importance, as a rule the purer the breeding the better the quality of the bone; e. g., the bones of the Thoroughbred are, according to their size, more compact, heavier, stronger than those of the Cart horse. The bones of the Cart horse are expanded as it were to allow more surface for the attachment of muscles. The question of the quality and quantity of bone has become a vital one in live stock: in the beef animal a certain fineness of bone is desired, as being one of the indications of small offal; on the other hand, an excessive lightness of bone is a defect in some breeds of hogs, rendering them incapable of carrying their carcass to market.

If we saw a bone in two we find it is made up of a hard and soft portion; in the soft portion a number of little holes are seen, which give the cutting (or section) the appearance of a section of a cane. These little holes (canals) are for the passage of the blood vessels whose function is to nourish the bone. One can see how that

too many canals would render the bone soft and spongy. The outside of bones is covered by a tough material, a skin known as **the periosteum** which can be stripped off; it is very strong and sensitive and contains blood vessels which serve to nourish the bone beneath. In the central part of the bone (medullary canal) is found the marrow, which by some scientists is held to be the birthplace of the blood plates (corpuscles).

Bone is developed from temporary cartilage or gristle.

The uses of (functions) bones are: 1. To bear weight. 2. To resist the effects of concussion. 3. To act as levers. Their fitness for the first two duties depends on the quality (texture), substance (size) and their arrangement. The soil on which an animal is raised and the feed on which it is fed influences the bone. The drier the soil and the harder the food the better the quality of the bone. The more open (porous) bone is, the greater the liability to bony deposits, examples of which are splints. The hoofs indicate the quality of the bone, e. g., flat feet and soft horn mean poor quality of bone. Among horsemen, the expression, "Flat bone," is often heard, such, however, refers to the shape of the whole leg, the desirable form being razor-like, the bone forms the heavy part of the razor, while the tendons (muscles) at the back of the leg form the fine edge; if there is an excess of loose tissue behind, the leg looks round, feels soft and the horseman utters the dictum: "The bone is round and spongy!" Large muscles mean large bones on account of the greater area required for attachment sites. The more bones are exposed to concussion the denser and stronger they should be. It is almost impossible to obtain

bone of great volume and at the same time of the finest quality. The number of bones varies according to the animal, in the horse, 191; ox and sheep, 196; pig, 270, etc., the sacrum being reckoned as a single bone, the bones of the tail (coccyx) averaging 16 for the horse, 18 for the ox; and 22 for the pig (Chauveau).

The present appearance of the various breeds of live stock is due to the process of evolution and to the efforts of man. For example, let us take the horse: back thousands of years ago (Eocene period) the ancestor of the horse was only the size of a fox and had four toes. Today specimens of horses can be seen 17 hands high, weighing 2,000 pounds, and only one toe, as seen when the structure of the foot is taken up; in fact the horse is now classed as belonging to the single-toed class (Solid ungulata); during the Miocene period it was the size of a sheep and had three toes, while in the Pliocene period, nearer the present time, it had become as large as an ass, and two of the toes were disappearing, until down to the present time we have the horse with the small splint bones to represent two toes possessed at one time by its ancestors. The efforts of man are tending to a *reduction of offal* and a *higher development of flesh production* in the meat producing animals. The gradual disappearance of wolf teeth and the lengthening of the space (diastema) between the front and back teeth are all quoted as evidence of evolution in the horse.

To render the study of the skeleton more easy it is divided into regions, each being taken up separately, the regions are: The head (skull), the neck (cervical), the back (dorsal), the loins (lumbar), the croup (sacral), the tail (coccygeal) and the limbs (appendicular).

The bones entering into the formation of these regions vary in shape, hence are divided in three classes: long, flat and irregular. All bones have at various spots (usually at the end) somewhat smooth polished spaces known as articular surfaces: when the articular surfaces of two bones are in contact a joint is formed. A further provision to ensure the surfaces of the two bones being kept in contact is the band-like structure made of white fibrous, connective tissue known as a Ligament. A ligament may vary somewhat in form according to its position, but its functions are the same, viz.: 1. Giving support (example, the lateral ligaments): 2. Confining the joint oil (synovia) by means of the capsular ligament. Two other forms of ligaments exist, namely, *check and suspensory*, but as they do not enter into the construction of joints, they are considered along with the muscles.

The Head. The bones of this region are quite numerous, 36 in all, and as their remembrance is of little practical value to the agriculturist they will not be considered separately. In the colt the boundaries of each bone are easily made out and the bones separated, as the animal grows older the bones grow together (become anchylosed). The majority of the bones of the head are quite light and thin and by their arrangement form hollow spaces (excluding the mouth and nose) which communicate more or less freely, and are known as sinuses: in the skull is also the brain cavity. If we dehorn a cow we notice that the horns are more or less hollow and that those cavities extend into the head, therefore we can at once see that "Hollow-horn, so-called," is not a diseased condition of the horns, but is perfectly natural. In the

cavities of the nose are some very light bones which are of importance in their relation to the act of breathing. These bones are covered with a very delicate mucous membrane, containing a great number of small blood vessels, the air as it passes over this membrane becomes warmed before being taken in by the lungs. The teeth, although properly classed with the bones of the head, will be treated of when the digestive system is being taken up.

The Neck. Behind and below the head we find the spinal (vertebral) column, made up of a number of sections, each called a vertebra. These vertebrae have a hollow passage (spinal canal) through their centers, this canal houses the spinal cord, thus protecting it against injury. These vertebrae are so constructed as to allow of movements between them, varying in degree according to their location. Considerable motion is necessary and it is provided for between the vertebrae of the neck, such enables the head and neck to be placed in different positions. The acts of raising and lowering, turning sidewise are accomplished by the action of powerful muscles attached to these bony sections. The site of the junction of the bones of the head and neck is the region of the poll, and it is these bones that are sometimes affected in severe cases of Poll Evil. The bony sections in the neck (cervical) region, number seven, and are somewhat alike, the two first (atlas and axis) showing the more marked differences.

The Back. Passing along the back (dorsal region) we find that the vertebrae forming this region are shorter and more numerous, being 18 to 19 in number. They

resemble the bones of the neck, save that their upper surfaces are marked by sharp projections or spines. The highest of the spines (those of vertebrae Nos. 4, 5, 6) together with the muscles, etc., of the part form the region of **the Withers** — hence the disease known as fistula of the withers (fistulous withers) gives the location of the trouble. These projecting spines are very well marked in the dairy type of cow, projecting as they often do in such animals above the tops of the shoulder blades, along with which they tend to give the desirable wedge shape when viewed from above. In the beef type of animal the spines are not as prominent, the muscular or fleshy covering of the parts being more abundant. In the better bred horse, the withers are quite fine as compared with the coarser bred specimen. The sections of the backbone give attachment to strong muscles and ligaments. One ligament of peculiar character is noticed in the horse, it extends from the vertebrae of the back to those of the neck and to the head, and as a result of the support it gives, the horse is enabled to keep the head on a higher level than the rest of the body, consequently we might expect a crosswise section of it to cause the head to fall to ground, such sometimes happens as a result of attempts at surgery by quacks in the treatment of Poll Evil (fistula of the poll). The bony sections of the back also form joints (articulate) with the heads of ribs, one pair of which are allotted to each of the vertebrae of this region (dorsal).

The Loins. Passing back still further we come to the bones of the loins (lumbar region), six in number. These sections of the backbone should be strong, strength

here being a desirable trait in all animals. A slight difference in the loin between the dairy and beef type is noticed, the loin of the former tending to widen behind, in the latter an even width throughout is desired. These bones not only have spines above but also on each side, all being covered by powerful muscles, which muscular covering is one of the most valued parts in meat-producing animals, contributing as it does to form what are dubbed the high-priced cuts.

The Croup (pelvis or rump). Still further along the backbone are the bones of the croup (sacrum) which are more or less joined (ossified) together, according to the type of animal so varies the croup, in light horses, such as Cleveland Bays, a long, level croup is found, while in drafters a shorter, more drooping croup is desired; extending along the croup bone are muscles which give the rump its shape. In the dairy cow a heavily muscled rump is not desired, in fact, advanced thinkers along dairy lines hold that a high prominent croup (dubbed pelvic arch) is very desirable as indicative of plenty of room in the parts below, such ideas yet need data to render them acceptable.

The Tail. The last region of the spinal column is that known as the tail (coccyx), made up of 13 to 20 segments. The spinal canal cannot be said to go beyond the sacrum or the first few segments of the tail. A tendency exists among people to remove segments of the tail or the entire member, a proceeding which can only be justified in few cases, such as in sheep, when its removal is an aid to cleanliness, and occasionally in horses that have the habit of switching.

The ribs and breast bone (sternum) are attached together in a greater or less degree. The ribs gradually lengthen from the first to the ninth, thence becoming shorter to the 18th. In the horse the ribs are narrower, closer together and rounder than in cattle, in the latter the ribs are comparatively flat and broad. The desirable form of rib in the horse is the well sprung one, giving the body the shape known as the barrel. In cattle the spring of rib varies with the type, in fact, it may be stated that those animals used for meat-producing purposes should have a well sprung rib, the spring being right from the back, in fact, the upper part of the ribs aid in forming the great width of back so much desired. In the dairy cow the ribs take a somewhat different direction, the arch of the ribs resembling more nearly that of a hip roof than that of a barrel. It is very important that the ribs (5 and 6) just behind the front limbs should be well sprung so as to give plenty of lung room. This applies to all domesticated animals of any type or of any breed. The width of chest of the dairy cow is taken behind the shoulders about one foot below the withers. *The slab-sided animal*, so-called, due to lack of spring of rib, *is* generally *a notoriously bad doer*. The upper end of each rib forms joints with two vertebrae, the ribs are thus capable of being lifted up and outwards during the act of breathing. The factors determining the spring of ribs are: Heredity and lung development, for with good lung development in the young animal, bones which at that time are impressionable, so to speak, may and will be given direction. Heredity, of course, is the supreme factor of the two, and if good

conformation is wanted only animals with such conformation can be used as breeders with much chance of success. The numbers of pairs of ribs are, in the horse, 18; cow, 13; sheep, 13; pig, 14.

The expression — well-ribbed-up — refers to the closeness of the last rib to the hips, such a conformation is desired in all animals with the exception of the dairy cow. The reasons that it is so desired are several, in horses looseness of the coupling is often an indication of poor digestive and staying powers, and in the beef animals, the tissues forming that location, the upper flank, are tough, gristly, in fact, consequently not of great value as meat. The breast bone (sternum) receives the attachments of the first 8 ribs (true ribs) and resembles a boat's keel; if small and narrow, the floor of the chest will also be narrow; the front part of the breast bone and its coverings form the *brisket*. In dairy cattle we find it sharp, in other animals smooth, wide and well covered with muscles. The backbone, ribs, breast bone and the diaphragm (a large muscle separating the intestinal cavity from the lung cavity) constitute the boundaries of the chest cavity.

The Limbs. In the fore limbs there are the bones of the shoulder (scapula), the arm (humerus), forearm (radius and ulna), of the knee (the carpus, made up of 8 small bones), the cannon and splint bones (large and two small metacarpals), the pastern (os suffraginis and corona), the pedal, coffin and shuttle bones (os pedis and os naviculare), the last two being contained in the hoof. The long bones of the limbs are often said to have a shaft and two extremities, the latter, the expanded

ends which enter into and form the various joints: as a result certain motions take place between bones, to describe such movements the terms *flexion* and *extension* are used, thus a limb is said to be be *flexed* when bent, *extended* when straightened out.

The shoulder blade is flat and triangular in shape, with a spine on its outer surface, each side of the spine in the depressions thus formed are lodged muscles, which asisst in supporting the shoulder joint. The development of these muscles is important when we consider the wearing properties of the shoulder and its liability to collar galls, etc. The position or slope of the shoulder blade is of interest to note, because the slope of this bone is indicative, to a certain extent, of the positions taken by the bones below, e. g., in the light horse in which a great deal of action is required, there must be a sloping shoulder, such a condition increasing the elasticity of the gait and thus diminishing concussion. On the other hand, in the draft horse a more upright shoulder is preferred, so as to bring a good bearing surface into the collar, consequently we notice in the heavy horse a more upright shoulder and pasterns than in the light horse.

In the dairy cow the slope of the shoulder blades are towards one another at their tops, thus giving one of the wedges of the triple-wedge desired by dairymen. The lower end of the shoulder blade, together with the upper end of the arm, forms a shallow ball and socket joint, one in which there is considerable play. This joint, like all the others, is surrounded by what is known as the *capsular ligament*, from which is secreted the joint oil

(synovia), a strawy yellow, clear, somewhat oily liquid, which is for the purpose, practically, of oiling the joints. The bone of the arm (humerus) is a long bone, sloping downwards and backwards. It is very strong and gives attachment to powerful muscles. The slope of this bone varies in light and heavy horses, in the latter being nearly horizontal, as the score card terms it "arm thrown well back"; with the bones below it forms the elbow joint, which is of the hinge variety, several powerful ligaments tend to hold these bones together in place. The bones of the forearm (radius and ulna) differ considerably in animals, especially with regard to the development of the ulna. In horses the ulna is small and fastened to the radius, while in cattle, sheep, swine and Man, it is about equal in size to the radius and is free, in fact, the development of the ulna seems to be directly proportional to the number of fingers or toes possessed. The bones of the forearm are long bones. At the upper end of the ulna is the point or cap of the elbow and the location of "shoeboil." The bone of the forearm and the upper row of bones in the knee form a hinge joint, the usual ligaments, such as the capsular and the supporting or binding ligaments being present. **The knee** or carpus is made up of eight bones arranged in two rows; one bone, the trapesium, is situated at the back of the knee, and if well developed may give the leg the appearance of "being tied in"; this bone is usually well developed in well bred horses, it gives a leverage to some of the muscles that have to do with the flexing of the knee. A ligament stretches from the trapesium across the back of the joint and thus forms a groove through which plays a tendon (flexor pedis perforans).

If the bones or tendons immediately below the knee are lacking in size (substance) the limb is said to be "tied in"!

The joints of the knee belong to the hinge variety, the extent of movement getting less from above down. If, as the result of inflammation of the parts, bony deposits are thrown out and the joint movement limited or arrested, the condition is know as knee-spavin. The cannon bone has attached to it on its hinder surface two small bones commonly called *splint bones.* These splint bones often terminate at their lower ends in little knobs, which are apt to be mistaken by the novice for *splints.* Bony deposits thrown out between the cannon bone and a splint bone constitute *splints.* The knobs are normal, the splint is abnormal. The cannon articulates with the long pastern bone below and thus forms the fetlock joint, which is of the hinge variety, behind this joint are two rounded bones, the sesamoids. The long pastern bone forms a hinge joint, the pastern joint, with the os coronæ. This bone, the short pastern bone, also articulates with the bone of the foot, os pedis. The coffin bone is semi-circular in outline, somewhat the shape of the hoof; at its back extremities are the wings, so-called, to each of which is attached a half moon-shaped piece of gristle (cartilage), known as the **lateral cartilage.** The round, upper borders of these cartilages can be felt quite readily at the upper and back part of the hoof, they should be movable, if not they have become bony (ossified) and are henceforth known as sidebones; in some horses the cartilages are naturally firmer than in others, such cases must not be mistaken for side bones.

In ruminants (animals that chew the cud, e. g., cattle and sheep) the cannon bone is split at the lower end and the pastern bones are just doubled in number, the bones of the foot, however, comprise two separate halves, the space between forming the cleft. It is in the region of this cleft that trouble occurs in the feet of cattle and sheep, rarely, however in hogs, due to particles of dirt and gravel which irritate the parts, or else the result of infection.

The hind limb. It is worth while noticing the difference in the manner of attachment of the front and hind limbs to the trunk. The fore limbs are only attached by muscles, in fact, the body may be considered as slung between the front limbs; in the hind limbs a bony attachment exists between the trunk and limb. This attachment is between the bones of the croup and one of the pelvic bones (ilium). The pelvis, the large bony ring at the exit from the abdominal cavity, is formed by the croup (sacrum) and the ossa innominata, a pair of bones, each of which is made up of three bones. The three bones have technical names which we shall have to use in default of others; they are: Ilium, ischium and pubis. The ilium is flat and is triangular in outline, two of its angles, the outer and inner, can readily be seen in thin animals. The outer angle is known as the hip bone or hooks in dairy cattle, in which type a certain prominence is desired, the opposite condition is desired in animals of the meat type. Sometimes the result of an accident, due to carelessness, etc., such as crowding through narrow doorways, this hip point is broken, and the animal is then said to be *down in the hip*; the lesion can be

noticed by standing squarely behind the animal. The ischium, the next largest bone of the trio, situated behind the ilium, is somewhat similar in shape; only one angle is seen and that forms the point of the buttock or pin bone; sometimes this protuberance is broken off, to detect it a side view is necessary. The two ischii are united to form the back (posterior) part of the floor of the pelvic cavity, in sheep and cattle a notch is formed at their points of union. The pubis is a flat bone and with its fellow forms the fore (anterior) part of the pelvic floor; on the pubis rests the bladder. The ischii and pubes of cattle, sheep, swine, etc., are slow to grow together, consequently there is considerable allowance for widening of the pelvic cavity, a condition of great service to these animals when bringing forth their young; in mature horses these bones are fused together, no play is possible in that direction.

All three bones unite at one point to form a deep socket, known as the acetabulum, which receives the head of the thigh bone (femur). This joint is a deep ball and socket with the usual ligaments to support it, etc., in the horse (all solipeds) a ligament is present which is not found in cattle, hence we account for the side kicks from cattle (mule?).

The hip joint is quite prominent in dairy breeds and is known as *the thurl*. The thigh bone (femur) is very strong, slopes down and forward, and at its lower end is enlarged to form two joint surfaces, one of which is pulley like, the inner lip of the pulley surface being the larger. On the pulley surface plays the stifle bone (patella or knee cap of man), owing to the conformation

of the parts the stifle may be displaced outward, but not inward: this displacement depends greatly on the state of the lateral ligaments. The bone of the stifle receives a number of ligaments and also muscles. The bones of the lower thigh (tibia and fibula) articulate with the other joint surface of the femur, the motion is that of a hinge. The largest of these bones (tibia) is very bare of musular covering on the inner side, an extra thick covering of periosteum is there present, however; this bone is sometimes broken by a kick, the breakage (fracture) may not be noticed, the ends being held in place by the strong periosteum, unless the animal is put to work, when the ends become displaced and as a result acute lameness, necessitating slaughter of the animal. The fibula is small in the horse, in cattle and sheep is represented by a fibrous (gristly) cord, in the pig it extends the entire length of the tibia.

The hock joint. The expanded end of the bone of the lower thigh (tibia) meets the two large bones of the hock (tarsus, ankle in man) and forms with this pulley surface probably the most important joint, in animals, from the horseman's standpoint, owing to the great amount of work done and to the peculiar arrangement of the bones. It is in the region of the hock that such diseases as *curb*, *spavin*, *bone* and *bog* are found. This joint is known as the true hock joint and is of the hinge variety, when motion takes place the tendency is to turn the foot outwards in the direction of the pulley surface. The hock is composed of six bones, arranged in rows, the upper row containing the two main bones, os calcis and astragulus. The os calcis (the heel bone of man) has attached

to its posterior surface a ligament which, when sprained and enlarged, constitutes a *curb*, a condition resulting from the conformation (curby or sickle hocks), or the work performed (in stud males). One of the hock bones, the cuboid, situated on the outer side of the hock, just below the calcis, may be rough, and in such cases may cause the animal to be credited with a spavin or curb, in all such cases *the hocks should be carefully compared* and coarseness of the bone *not* mistaken for diseased conditions. The joints of the hinge variety between the lower rows of hock bones are not as important, as the motion allowed is not nearly so extensive as in the true hock joint. Below the hock, the bones are arranged in a similar manner to those in the fore limb. Abnormal bony enlargements are sometimes present on the pastern, and are then known as *ringbones; splints* are rarely present on the hind cannons.

Location of points or parts in animals. The accompanying figure will give the novice an idea of the location of the various points in dairy cattle; in a general way the figure can be used for other classes of live stock.

The poll is the space between and just behind the horns of cattle and ears of horses.

The forehead, that part of the head from the base of the ears to a line drawn from the inner corners of the eyes.

The forelock, the tuft of hair between the ears.

The face (4), that portion between the level of the eyes and the muzzle.

The muzzle (5) includes the nostrils and the lips, in pigs known as *the snout*.

The crest is the upper part of the neck from the ears to the withers.

The brisket or breast (12): the shoulder tops (11) by some authorities are termed *crops* in cattle, although the usually accepted location by most people is that indicated by the number 13.

The withers have already been mentioned, 11 shows the location clearly enough.

The arm is located about the line dividing the shoulder from the leg in the figure.

The fore-arm is pointed out by the number 24, *the cannon* or *shin* by the number 23, *the hoofs* or *claws* by number 25, *the coronet* being the soft elevation at the upper part of the hoof.

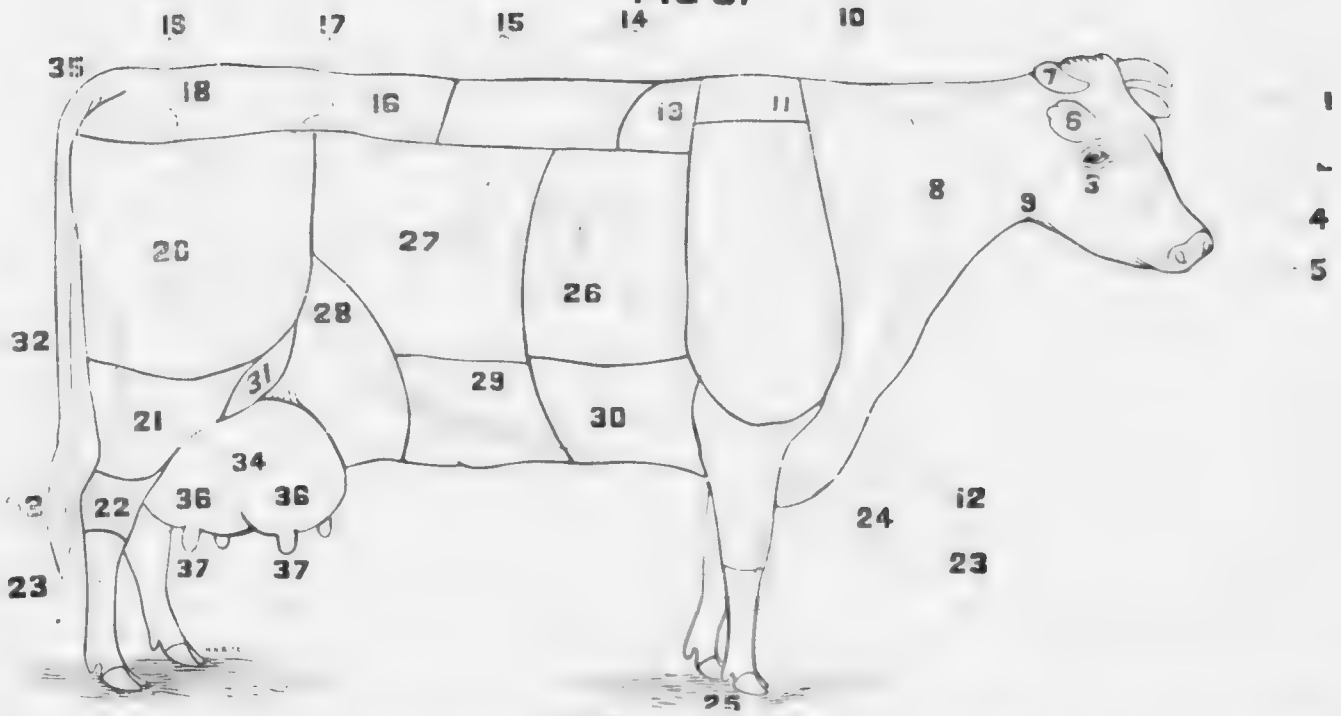
The fore-flank is located just behind the elbow, shown by number 30, *the fore-ribs* (26): in beef cattle 29 and 30 constitute *the plates;* 27 constitutes the location of *the back-ribs*, the upper portion sometimes being termed *the coupling, the flank* is shown by 28. *The chine* (14) includes that part of the back from *the loins* (16) to the shoulders. *The hips* or *hooks* (17) are the front boundaries of *the rumps* (cattle), *croup* (horses), indicated by 18; 19 shows *the hip joint* or *thurl*. In the retail beef trade the porterhouse and sirloin cuts are taken from the loin cut: tenderloin steak is taken from the inside and just beneath the ribs on either side of the spinal column, is furnished by the psoæ muscles, it this is done the porterhouse cut is spoiled: the rib roast is got from the spot 26, the fore-ribs. *The rib* and *loin* cuts are divided between the twelfth and thirteenth ribs, and *the loin* separated from *the round* at the point of the hip. The divis-

ion between *shoulder* (chuck) and *rib* cuts is made between the fifth and sixth ribs.

The flank (28) in the horse, strictly speaking, extends from the loins to the belly. The lower thigh, gaskin, or gammon in pigs is the lower part of the region showing number 21; *the dock* is the solid part of the tail.

The height of a horse is the vertical distance from the highest point of the withers to the ground, the girth is taken around the body, just behind the shoulders, the depth of the chest being measured at the same spot.

FIG 3.



POINTS OF THE COW.

1—Head. *2* Forehead. *3*—Eye. *4*—Face. *5*—Muzzle. *6*—Ear. *7*—Horn. *8*—Neck. *9*—Throat. *10*—Shoulder. *11*—Shoulder Tops. *12*—Chest. *13*—Crops. *14*—Chine. *15*—Back. *16*—Loin. *17*—Hip or Hook. *18*—Rump. *19*—Thurl. *20*—Quarter. *21*—Thigh. *22*—Hock. *23*—Leg. *24*—Fore-arm. *25*—Hoof. *26*—Fore-ribs. *27*—Back-ribs. *28*—Flank. *29*—Belly. *30*—Fore-flank. *31*—Stifle. *32*—Tail. *33*—Switch. *34*—Udder. *35*—Setting of Tail. *36 36*—Quarters of Udder. *37 37*—Teats.

CHAPTER II.

THE MUSCLES AND THEIR WORK.

The bony skeleton is clothed with several varieties of tissue, of which the muscles are of primary importance in the study of conformation and the fitness of the animal for food purposes. Another tissue is connective tissue, of a strong, fibrous nature, which proceeds inward from the skin, running between portions of the muscles, and thus gives coarseness and the grain to meat (muscular tissue). The less exposed a muscle is the smaller the amount of connective tissue. Connective tissue also forms ligaments and tendons (the gristly parts of muscles), ensheathes bones, cartilage (gristle) and nerves. If connective tissue is present in excessive quantities it renders a muscle hard to define, is the cause of the so-called round bone of horsemen; therefore, we can make several valuable deductions with regard to the animal, as follows: 1. As the thickness of the skin is a measure of the amount of connective tissue, the thicker the hide, other things being equal, the more connective tissue in and about the muscle; these observations can be made by any practical man. 2. As its action is nil (passive), the more connective tissue entering into a muscle the slower the movement of that muscle; hence, as a result, a poorly defined muscle, as for example seen below the knee or hock, and a thick skin may be taken to imply deficiency in speed. In meat-producing ani-

mals, the quality is interfered with if the connective tissue is in excess, the coarseness, lack of pliability of the skin, being indications. **Meat** (muscle) showing several colors, rainbow-like, is always tough, due to the presence of connective tissue which, being mixed in with the muscular tissue, gives the peculiar play of colors. In all live stock, excellence of breeding shows in the quality of the skin, hence we have sound reasons for the use of well bred sires and dams in preference to the mongrel, whether the progeny is for draft purposes or for food. Muscles constitute the lean of meat and are made up of fine fibres. Movement takes place by the shortening (contraction) of these fibres. The strength of a muscle is proportionate to its thickness, other things being equal; it has been estimated that a muscle contracts about two-thirds of its length, therefore, the stride depends on the length of the muscle; as length of muscle is accompanied by length of bone, we can often judge the former by the latter. In the race horse we desire the greatest possible length of muscle with sufficient strength for carrying weight. As a thin muscle will contract as quickly as a thick one of the same length, therefore, the larger muscle would be a disadvantage, owing to the increased weight of bone and muscle, and consequently greater friction, together with increased slowness to nervous stimuli. Muscles are divided into fleshy and tendinous portions, the latter are tough, hard, fibrous cords (sinews); being for the purpose of economizing space and for attachment to bones. Muscles are related to the body and limbs according to their actions and locations. The amount of force exhibited by a

muscle is proportional to the degree of stimulation given by its nerves, therefore, the more energetic in action, the stronger, other things being equal.

When speaking of muscles, the fixed end is *the origin*. the part (or end) it moves, *the insertion*. Some of the more important muscles are here taken up and their actions, origins and insertions mentioned, those of the limbs being of especial interest, as dealing with locomotion. The first muscle seen after the removal of the skin is the one that twitches the skin, the fly-shaker, panniculus carnosus, its boundaries are of no particular interest, its actions are, assisting as it is said to, in the expulsion of air from the lungs when highly developed, seen in the race horse.

When the foreleg is advanced, the shoulder joint is *extended* and elbow joint *flexed*, when drawn back the opposite takes place, due to the action of a powerful muscle (triceps extensor brachii) attached at one end to the front of the shoulder blade and point of the elbow, just below the level of the elbow joint. Another powerful muscle (flexor brachii) attached to the point of the shoulder blade and at the other to the head of the bone of the forearm, *flexes* (bends) the shoulder joint and *straightens* (extends) the elbow joint. There are other minor muscles that assist in these movements. Three muscles (flexor metacarpi externus, medius and internus) *bend* the knee, they originate on the back of the arm just above the elbow joint and are inserted to the bone at the back of the knee (trapezium) and the splint bones. The two muscles (extensor pedis and extensor suffraginis), which *straighten* the fetlock, pastern and coffin joints, run down

the front of the forearm, one originates at the head of the bone of the forearm and is inserted on the front surface of the upper pastern bone: the other commences on the bone of the arm just above the elbow joint and ends on the upper and front part of the coffin bone. Those muscles which *bend* the fetlock, pastern and coffin joints and aid in bending the knee, originate on the back part of the forearm; a short distance above the knee they become tendinous (sinew-like) and form what are known as the "back tendons," or, as they are sometimes called, the cords or sinews: at the back of the knee they pass through

A. Lateral extensor of metacarpus. B. Flexors of the foot. C. Carpal ligament of perforans tendon. D. E. Perforatus. F. Small metacarpal splint bones. G. Suspensory ligament. H. Lateral band of metacarpal phalangeal sheath. I. Perforans tendon. J. Biceps. K. Anterior, or great extensor of the metacarpus. L. External metacarpi. M. Oblique extensor of the metacarpus. N. Tendon of anterior extensor of metacarpus. O. Branch of suspensory ligament. P. Extensor pedis, joining branch of suspensory ligament above. The lines shown at knee indicate location of annular ligament or knee cap.

a sheath formed by the trapezium and binding (annular) ligament, thence down the back of the cannon bone. The one lying in front (the flexor pedis perforans) lies just behind the suspensory ligament, goes over the sesamoids, little round bones at the back of the fetlock, down the back of the pastern until it passes over the shuttle bone (os naviculare), which has a smooth, pulley-like surface, and is then inserted (fastened) into the under side of the coffin bone. It is of interest to know that this muscle is re-inforced just below the knee by what is known as the *check* ligament. When discussing the joints, structures called ligaments were mentioned and their functions described: in connection with the muscular tissues, there are what are known as *suspensory* and *check* ligaments, whose offices are to render assistance in a greater or less degree to muscles. The suspensory ligaments are very powerful, and if the back tendons were severed would prevent the fetlock sinking to the ground. The suspensory ligament lies right behind the cannon and between the two splint bones, it originates at the lower row of knee bones and passes to the fetlock, a short distance above which it divides into two bands, which are inserted to the sesamoids, parts of the ligament, however, pass down and forward and unite with the muscle (extensor pedis) that extends the foot. It is a question whether this ligament is capable of stretching, in dogs, cats and pigs its place is taken by a muscle, in man by two muscles. The check ligament (carpal stay) is a continuation of a powerful ligament which fills in the spaces at the back of the knee joint, as stated; it assists one of the back tendons. The rear-most tendon

(flexor pedis perforatus) lies just behind the perforans and underneath the skin, and receives a re-inforcing ligament above the knee. This muscle proceeds down the back of the limb and forms a sheath at the fetlock, through which the tendon of the perforans passes and is inserted on the short pastern bone. The *suspensory ligament and two tendons* should be *hard* and *well defined* in the horse; to be so, there must not be a great amount of connective tissue, the nervous tone must be good, and there must be no inflammation or its products in the parts. Capt. Hayes, in "Points of the Horse," says the factors in producing strong tissues, such as clean, hard muscles, are Heredity, hard food ("oats, *not corn*"), exercise, a dry, warm climate and Eastern blood. The first three factors are well under the control of every farmer; knowledge of such factors and their intelligent use render breeding operations more successful and, consequently, more satisfactory. Some very large and very powerful muscles (Latissimus dorsi, serratus posticus, longissimus dorsi) extend along the back and loins, they contribute to the breathing movements of the animal and extend the spine: the **valuable meat cuts** of the back and loins are contributed largely by these muscles; in fact, if an imaginary line be drawn from the shoulder point to the point of the buttock, nearly all of the valuable cuts will be above that line.

Four powerful muscles, the pectorals and the serrati, forming the muscles of the armpits, are the means by which the body is slung between the fore legs. The muscles of the hind limbs are of great importance and some of them of immense size; in the meat type of ani-

mal especially great muscular development in this region is essential, as these muscles contribute largely to the high priced cuts.

The hip or croup is *extended* by the great rump muscle (gluteus maximus), which also exists in rearing, and by some muscles which lie at the back of the thigh bone (femur). The great rump muscle is attached to the upper portion of the pelvis (Ilium) and runs forward as far as the last rib, its insertion being on the head of the thigh bone. The muscles at the back of the thigh originate on the under surface of the pelvis from behind the hip joint to the point of the buttock and are inserted principally to the lower part of the thigh bone or the upper portion of the bone below (the tibia). The hip is *flexed* by muscles (psoae) that have their origin on the under surface of the last dorsal vertebrae and ribs and the loin; they also tend to *arch* the back and bring the animal to its feet after rearing; the insertions are on the thigh bone. Other muscles (triceps adductors femoris sartorius and pectineus) which are attached to the under surface of the pelvis in front of the hip joint, the thigh, stifle and lower thigh also *flex* the hip. Some of these muscles also draw the hind limbs outward (abduct) some inwards (adduct).

The stifle is *extended* by one muscle (rectus femoris) which has its origin on the under surface of the pelvis just in front of the hip joint, its insertion being to the stifle. This muscle also *flexes* the hip. The stifle is *flexed* chiefly by a muscle (biceps rotator tibialis) attached to the pelvis behind the hip joint and to the lower thigh (tibia) or gaskin.

The hock joint *straightened* (extended) by the muscles of the gaskin (gastrocnemii) which have their origin on the lower part of the thigh bone, one has its insertion to the point of the hock, the other to the bones of the pastern and foot; the latter when extending the hock flexes the fetlock and joints below. Its principal use is as a mechanical brace during standing and thus preserves the balance: these two muscles form the hamstring.

Flexion of this important joint is performed by powerful muscles (flexor metatarsi, extensor pedis and peroneus). The peroneus originates on the fibula, joins the extensor pedis below the hock, and is of interest because of the radical operation performed on it with the idea of curing *stringhalt*; it is really an accessory (helper) muscle to the extensor pedis. The flexor metatarsi originates at the lower end of the thigh bone and terminates at the lower portion of the hock by four insertions, one of which is prolonged over the site of *bone spavin*, and in surgical work for the relief of such a condition is often severed. The extensor pedis originates on the side of the lower end of the thigh bone and is attached to the three bones below the fetlock, consequently the joints below the hock are extended by this muscle. An acquaintance with the origins, insertions and actions of the limb muscles is of especial value as an aid to detect and locate lameness. The apparatus for performing movements in animals is, as is seen, composed of bones, ligaments and muscles, which are brought into a more or less intimate relation, we might term it frictional relation. Nature has made provision to reduce the friction and its consequences to a minimum, by what is

known as joint oil (synovia). It has already been stated that this fluid is present at the joints, being secreted from the lining of the *capsular ligament*, besides these locations it is also found in little bags or sacs (*bursae*) of shapes varying with the location, placed between a *tendon* and *bone* or between *two tendons*. From various causes resulting in over-stimulation of the secreting membrane, an overplus of this fluid is secreted, thus accounting for swellings in various parts, of which *bog spavin* and *wind puffs* are familiar illustrations.

CHAPTER III.

THE DIGESTIVE SYSTEM.

An acquaintance with the arrangement and methods of working of the digestive organs is essential to the feeder of fat stock, the feeder of dairy stock and the person who feeds for work. It has been found that the higher the organization the more complicated is the digestive process. In order to render the process easily understood four divisions or stages are outlined, as follows:

1. **Prehension and Mastication,** referring to the seizing and chewing of food, the preparatory stage calling into employment the lips, tongue, teeth and glands of the part.

2. **Secretion,** the process of saturation of food materials with the digestive fluids (gastric juice, bile, pancreatic juice).

3. **Absorption,** referring to the taking into the system of the prepared materials obtained from the food, employing such tissues as the blood and lymphatics.

4. **Excretion,** the process of throwing out, by means of the excrements (feces and urine), sweat, and breathed air, the waste material, that part of the food from which the nourishment has been extracted. It does not follow that this latter is always the case, e. g., the profit obtained by letting shoats follow steers, showing that a large part of the food was not used by the steers.

Mucous and Serous Membranes. Widely differing as these membranes do in their location and functions, for our purposes we may consider them somewhat alike in construction. **Mucous membranes** may be said to line open cavities or tubes, such as the nose, mouth, the entire digestive tract, the breathing (respiratory) tract, and the genito-urinary tract (containing the organs of reproduction and the kidneys, bladder, urethra, etc.) The main point of interest regarding the mucous membranes probably relates to that part of the intestinal tract in which absorption takes place, and under which heading the forms taken by the mucous membrane, for short often written **m. m.,** will be described.

Serous membranes, on the other hand, consist of two layers, and line closed cavities, parts of the animal body not communicating with the outside world. While serous membranes have a wide distribution in the body, yet in that distribution they lose their identity, becoming known according to their location, e. g., the serous membrane of the abdominal cavity is termed the **peritoneum,** in it are suspended the intestines; the inner layer of the peritoneum is in one part named the **omentum,** at another the **mesentery.** The serous membrane of the lung cavity is the **pleura,** that of the heart the pericardium. As a result of inflammation of serous membranes, fluid is thrown out between the layers, e. g., water in the chest (hydrothorax) after pleurisy. The serous membranes should always be examined in post mortems of suspected tuberculous animals.

The digestive tract is practically a long hollow tube running from one end of the body to the other, having

sacs or recesses at intervals. This tube is made up largely of muscular fibers and nerves, a fact to remember in the treatment of such diseases as stoppage of the bowels from over-feeding, with the resultant **paralysis** of the muscular fibres of the bowel, consequently the administration of purgatives in such cases is **not** advisable until the paralyzed condition is overcome; sometimes these muscular fibres are cramped, illustrations of which are seen in spasmodic colic. The lining of the tube is a delicate tissue known as mucous membrane, which is made up of layers of cells in which are blood vessels, nerves and glands, the surface of this mucous membrane is smooth; although it may be more or less roughened, as seen and felt on the tongue of animals; in the small intestines this membrane is arranged in little finger-like projections known as **villi.**

1. Prehension and Mastication and the organs employed. The seizing of food and conveying of that food to the mouth is performed in various ways by the different animals, the horse uses the upper lip and front teeth for this purpose, the cow using the tongue only, thus we understand the fallacy of letting cattle follow sheep on pasture land; sheep use a combination of tongue and lip, the hog uses both upper and lower portions of the snout, they both graze and root. The mouth is the entrance to the digestive tract, it contains the tongue, teeth, and receives the secretions of the salivary glands; it is guarded by the lips, formed of circular muscles and sensitive hairs. Animals that chew the cud (ruminants) frequently lack the front upper row (the incisors) of teeth, the place of which is taken by a firm pad of gristle (cartilage), it is also inter-

esting to note that the teeth of such animals are loosely imbedded in the sockets. The roof of the mouth is formed by what is known as the hard palate, mucous membrane thrown into cross folds. The presence of an artery is made known if one lances just behind the third bar, an operation often performed by blacksmiths and others for Lampas. The cheeks are made up of muscles which are exerted to keep the food between the teeth; on the inside, close to the fourth grinder (molar) a little elevation is felt, which is the point of entrance of the duct carrying the saliva from the parotid gland. The tongue is the organ of taste, is freely movable and in some animals can be extended quite a distance; it is made up of *muscular* tissue, a fact which must be remembered when seizing this organ, or sprain of the muscular fibres will result and the animal may be thus rendered unable to use the organ as it should; the mucous membrane which covers the muscular portion is in the horse quite smooth, in the cow and sheep quite rough, due to its arrangement in little tufts called papillæ. The tongue in swine and sheep is comparatively small. Irritant medicines must *not* be administered undiluted or the mucous membrane will be damaged. At the back let down from the roof of the mouth is a double fold of mucous membrane known as the soft palate; its size in the horse bars the exit of breathed air by the mouth. hence the horse breathes only through the nostrils. This soft palate does not hinder breathing through the mouth in cattle and sheep. The mechanism of drinking is controlled by the organs mentioned, in the young animal the lips are placed around the teat, a vacuum is formed and the milk

is forced into the mouth by the pressure of the air, such a process constitutes the act of sucking. In the mature animal, pumping is the method employed, the lips are immersed below the water, a small opening is made between them, the tongue withdrawn and a vacuum formed, the air pressure forcing the water into the mouth.

The Teeth. In the mouth cavity those important organs, the teeth, are found. It has been said, and with a great deal of truth, "no foot, no horse," the substitution of tooth for foot would make another adage as significant as the old one and just as true whether referred to the horse, ox or sheep, as on the condition of the teeth depends the health and consequent ability to do work or make gains. Every horse, and for that matter, the other animals, have two sets of teeth, the milk or colt (temporary) teeth, which are shed at different periods in the early life of the animal, smaller and whiter than the permanent, which are intended to last the animal the balance of its life. In sheep the front (incisors) permanents tend to fall out at from 8 to 10 years, in cattle rarely so, while in horses the front teeth remain, the grinders (molars) are, however, quite often diseased, necessitating their removal. Although a simple looking object a tooth is composed of bony materials, the hardest in the animal body. The visible part of the tooth (the crown) is formed of dentine (an ivory-like substance) which is covered by a layer more or less thick of a white, still harder substance, the enamel. The invisible part of the tooth (the fang) consists of a comparatively thin layer of crusta petrosa, and is chiefly made up of dentine.

The wearing surface (upper) is known as the table of the tooth, and it is on the tables of the front teeth (incisors) that the various marks are seen which are treated of when discussing the age of a horse. As to kinds of teeth there are two, classifying them according to their construction, viz.: *Simple*, e. g., the nippers or incisors, and the tusks or tushes (canines); *Compound*, the grinders (molars). The teeth will be considered according to their location, hence three sets — those at the front, **nippers** *or incisors*, the **tushes** *or canines*, and the back teeth, known as *the grinders or* **molars.**

The incisor teeth in horses, cattle and sheep are made use of by the stockman to determine the age of the animal, by taking into consideration the time of appearance of those teeth, the amount of wear shown on their tables, and by their shape.

On the tables of the incisors the enamel forms a depression known as the *cup or cusp*, which is filled with the tooth cement, generally discolored by the food, thus accounting for the black mark found in the cup. When an incisor has been in use for some time its table (wearing surface) presents two irregular rings of enamel, an outer and an inner one. The inner ring surrounds the cup (cusp); the dental star (so-called) is a spot on the tables found at certain periods between the cup and the front edge of the tooth. The tusks or canines are not always present, rarely in the mare, in fact these teeth are considered as a mark of masculinity. In cattle and sheep there are no upper incisors, as has been mentioned; the incisor teeth in cattle especially are quite loose in their sockets.

The molars (grinders) are somewhat square, looking at the table surface; while the temporary or milk molars are only twelve in number, there are twenty-four permanent molars. The upper ones are set a little to the outside of the lower ones, due to the slightly greater width of the upper jaw. The surfaces of these molars do not form two horizontal surfaces, but two sloping ones, the outer edge of the upper molars coming lower down than the inner edge of the same teeth, whereas the lower row of molars have the inner edge higher, this fact has to be remembered in the operation of dressing (floating) the teeth. The formula below gives the number and arrangement of the teeth in the adult of the different animals:

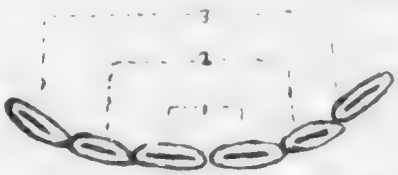
	Incisors.	Canines.	Molars.	Total.
	6	2	12	
Horse	6	2	12	40
	0	0	12	
	8	0	12	
Ox	0	0	12	32
	8	0	12	
Sheep	0	2	14	32
Pig	6	2	14	44

The tushes of little pigs are sometimes black and generally sharp, though it is doubtful if the blackened condition affects their health, yet it is advisable however to break off their tushes, as in fighting for the teat they are very apt to tear it, and cause soreness of the udder, with a consequent disinclination of the sow to let the pigs suckle her.

Telling the Age. Foals at birth have four incisors, the middle ones, and twelve molars; at six months four lat-

erals appear; at six to nine months the corners show. The permanent incisors appear at three, four and five respectively, the tusks (canines) from the fourth to the fifth year; thus a horse is said to have a full mouth (a complete set) at five years. Soon after that time changes can be seen to have taken place in the incisors as follows: At six years the black mark disappears from the central incisors of the lower row, at seven from the lower laterals, at eight from the corner teeth of the lower row. Beyond that age the signs are not as reliable, yet generally the black marks disappear from the upper centrals at nine, the laterals at ten, and from the upper corners at eleven. A general idea of the age after eight years may be obtained by noting the shape of the teeth, owing to the fact that as the animal grows older the incisor teeth become narrower from side to side and deeper from front to back, assuming gradually and consecutively square, triangular and round appearances. The following diagram represents the time at which the incisors appear and will be a help in determining the ages of the horse, ox and sheep.

HORSE.

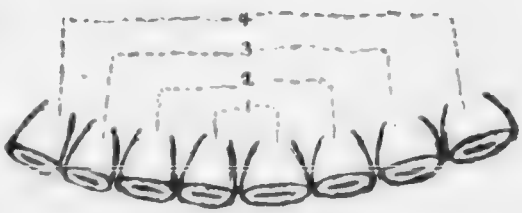


1 3 years.
2 4 years.
3 5 years.

OX AND SHEEP.

Ox: 1—1½ years
2—2½ years
3—2⅝ years
4—3 years

Sheep: 1—1 year
2—2 years
3—3 years
4—4 years



In horned cattle the age is calculated quite reliably by the wrinkles on the horns, the first one appearing at two years, the others at intervals of one year. Evidences of teething, such as shedding of the milk teeth are well marked in the colt, by the presence of the crowns (so-called) of the milk teeth in the feed box, quite often by a loss of condition and disinclination to eat. Sheep and cattle rarely show marked symptoms of tooth troubles, the latter may, however, if affected with Lumpy Jaw (Actinomycosis). Owing to the fact that the molars (grinders) are the most important teeth in the horse, a yearly examination by a competent veterinarian of the mouths of all horses owned will result in a saving of feed and better health in those animals.

The various changes in the teeth on which are based the determination of the age of the animal have been described, the methods of making such an examination follows: The methods described may be varied from, but as they are workmanlike are adopted, being the result of experience.

In the Horse. The examiner steps to the off side of the horse and facing ahead with the left hand placed on the cheekstrap of the bridle or halter, the right hand parts the lips, thus allowing the general shape of the teeth to be seen, if, as a result of the examination, the animal appears to be over five years, the tables of the teeth are looked at. The left hand lets go of the bridle, the two first fingers are run in the space between the front and back teeth, the thumb being employed to depress the lower lip, a gentle downward pressure is applied and the tables are then in view; it may be necessary with

the right hand to elevate the upper lip: in order to do so the examiner swings round in front of, and faces the horse. It is advisable in all cases when examining a strange animal to be on the alert, so as to avoid bites or kicks and blows from the front feet: the *trained horseman* is always on the alert.

The Examination of the Sheep's Mouth calls for a precise method, so as to limit the struggling of the animal and allow of an accurate result being obtained. The sheep being caught, the examiner stands on the left side of the animal, and while applying pressure with the right knee to the left shoulder, by means of the right hand and arm, draws the head towards the right side; the right elbow and forearm fit in tightly to the shoulder and neck of the sheep. The fingers now come into play, the *forefinger* (index) of the left hand being placed in the horizontal position, and therefore parallel to the upper lip, gently elevates it, the *thumb* of the right hand at the same moment, also in the horizontal position, gently lowers the under lip, thus the teeth are brought

DETERMINING THE AGE.

well in the view and the animal being held fast cannot struggle. Skill in handling animals for various purposes is shown by the avoidance of any rough or harsh measures.

The apparatus for masticating food have been described, the processes will now be under discussion.

Mastication is the process of grinding food in the mouth, thus fitting the food for the action of the stomach juices. All grain eating animals need this process to break the envelopes of the grain so that the digestive juices may act; crushing (chopping) the grain renders the work of mastication easier. It has been stated that the muscles of the cheeks, the teeth, tongue, lips, jaws and saliva all have to do with the preparation of the food. The mouth is opened by depressing (lowering) the lower jaw, closed by raising it, the latter action calling for considerable force, hence the reason for the strong muscles forming the cheeks. The jaw motion is sideways in horses, cattle and sheep, and is changed from side to side at will. The tongue, lips and cheeks keep the food between the teeth. The food is moistened by the *saliva* (spittle), a fluid alkaline in reaction, containing a ferment-*ptyalin*, which acts on the starch of the food, converting it into sugar. This secretion (saliva) is the result of the work of certain glands, namely, the *parotid*, a grape-like structure situated just below the ears, with a duct running into the mouth at the fourth molar; *submaxillary*, smaller glands lying between the jaws, often enlarged in colt Distemper (strangles) and Glanders, the secretion being emptied into the mouth at the barbs just under the point of the tongue; *sublinguals*, a number of very small

glands, as their name reveals, lie under the tongue. The parotid gland is active only on the side on which chewing is taking place. In the horse these glands work only during mastication: in cattle they are secreting continually. Sight and odor of the food do not stimulate the glands.

Quantity of saliva secreted. The amount of saliva secreted in twenty-four hours is amazing. In the horse about sixteen and one-quarter pints per hour when eating hay, Colin stating five pounds of hay may be eaten in an hour, and Lassaigre estimates that for each pound of hay, 4.06 pounds of saliva, hence 20.3 pounds or about sixteen and one-quarter pints, one-third less if oats are the food, just one-half the quantity when on green fodder, and one-third if on roots; therefore, it is readily seen that the quantity varies with amount of water in the feed, in fact on the dryness of the food, not on the starch to be acted upon. Its action is more mechanical (i. e., for the purpose of mixing, softening, etc.) than chemical. The food is thus rendered easy of shaping into a ball (bolus), in which shape it is passed backward and swallowed. This fluid also aids in tasting foods, and keeps the mouth and teeth clean and moist; great quantities of it descend into the first stomachs of cattle and sheep, the fluid being secreted as soon as food is eaten or masticated.

Swallowing (deglutition) is quite a complicated process, although seemingly simple. It may be divided into three stages, during the first of which the food is under the control of the will and the food is passed back into the pharynx; in the second stage through the pharynx it is then beyond the control of the will, being only

brought back by coughing; in the third stage the bolus is carried over the larynx into the gullet, and by the muscular contractions of the walls of this tube is finally ejected into the stomach. As the latter stages of swallowing are involuntary the process known as *reflex action* is gone through as follows: A nervous stimulus is sent to the brain, the result of the presence of the bolus, and a message is sent back from the brain to the muscles of the pharynx and gullet directing the swallowing of the bolus. A horse may swallow thirty boli in fifteen minutes if very hungry, from ten to twelve if the edge has been taken off his appetite. Immediately behind the mouth is the cavity already spoken of as the pharynx; this cavity is common to the digestive and respiratory (breathing) tracts; it has several openings into it besides those already mentioned, namely, those of *the Eustachian tubes*, which communicate with the ear, and *the guttural pouches*, hollow cavities peculiar to the horse, found at the back of the pharynx; these cavities are sometimes filled with pus, and when thus may cause suffocation. The pharynx opens behind into *the gullet* (esophagus), a long musculo-membranous tube, the entrance to which is located just above and behind the larynx. This tube extends to the stomach, and its path can be seen in the neck during the passage of food or medicine; it is lined with a delicate membrane, and although containing a considerable number of muscular fibres, and therefore elastic is not meant for, nor is it improved by, the forcible passing of solid objects, such as broom handles or whipstocks. At its entrance into the stomach of the horse the mucous membrane is in

folds, forming a valve, thus preventing the return of food (vomiting, etc.) to the mouth; in cattle and sheep its entrance is, however, funnel-shaped, a condition favorable to the return of food to the mouth.

The Stomach. The digestive tract has been described as a tube with sacs or enlargements, the first of which is

STOMACH OF A HORSE.
G.—The gullet (œsophagus

the stomach. In the horse and pig it is a single sac; in cattle and sheep, an organ with four compartments, viz: *the paunch* or *rumen*, situated in the left flank of the animal, *the honeycomb* or *reticulum*, *the manyplies* or *omasum*,

the true stomach or *abomasum*, sometimes termed the rennet. The stomach of a horse resembles a bent tube in shape, with the openings close together on the upper border; it is lined by mucous membrane which shows a well-

TYPE OF RUMINANT (OX, SHEEP AND GOAT) STOMACH.

Photo of ram's stomach, the upper edge in the cut lies in the front position in the animal. **P.** – Paunch. **G.**—Gullet. **H.**— Honeycomb. **M.**— Manyplies. **R.**— Rennet or fourth stomach (abomasum).

marked dividing line and as a result two varieties of mucous membrane, the one a continuation from the gullet with no secreting glands in it, the other, or villous portion, the true digestive coat containing the gastric glands.

It is a good idea to consider the first three divisions of the ruminant stomach as a widening out of the gullet. The capacity of a horse's stomach is about 3 to 3½ gallons, that of the paunch (first stomach) of a cow 45 to 60 gallons, of a sheep's paunch 10 to 15 gallons, and of a pigs stomach 1½ to 2 gallons.

The process of rumination, although carried out with the assistance of the first three stomachs, is not a pure digestive act, but merely preparatory, hence we consider it as part of stage one. In some animals the food when swallowed is finely divided enough to be acted upon by the gastric juice in the true stomach, in others it has to be mixed and churned up with the mouth saliva in order to soften it before its return to the mouth for remastication. In birds digestion starts at once, although the food may not be finely ground. The process of returning the food to the mouth for a second chewing, known as *rumination*, is peculiar to the many-stomached herbivora (grass eaters). This process differs from *vomiting*, in that it is partly under the control of the will, in fact the one is abnormal (unnatural), the other normal (natural). If rumination stops for any length of time the cause should be looked for; as has been pointed out, the process consists of the passage up and down the gullet of food from the stomach: therefore, the **giving** of an animal **a cud** (so-called) is **a ridiculous practice** and one that cannot be expected to restore the natural movements which are in abeyance.

The reason given for animals ruminating is that when in the wild state food had to be taken in rapidly and chewed at leisure in a place of safety. The process is

stopped by fright or any unexpected happening, such as the presence of strangers; such being the case, as can be confirmed by any observing person, it behooves the attendant to avoid *harsh* treatment or *sudden, noisy* movements among cattle or sheep. The calf at early age craves bulky food in order to ruminate, in fact, outside of the necessity for bulky food with the idea of balancing the ration, it seems necessary to distend the paunch so that its walls may be stimulated to action; the other extreme must be avoided, however, because the ruminating process is stopped if the paunch is overloaded, due to paralysis of the muscular fibres of that organ. Overdistension with gas, a common occurrence from feeding on unmatured grasses and fodders, such as rape and clover with the dew on, will also stop the process; it is also stopped during the period of heat. *The longer rumination is stopped the harder it is to start again*, similar to other paralytic conditions, a result also of the drying out and impaction of the food lying in the paunch in an inert condition. A plentiful supply of water is necessary to assist in softening the food, which usually contains more or less woody fibre. The gullet opens into the paunch which communicates with the honeycomb, or water bag, as it is often called, due to its fluid contents; these two compartments communicate with the manyplies (omasum), and it by a small opening into the true stomach (abomasum). The honeycomb is situated in front and below the paunch, hence it becomes the water bag.

The contents of the manyplies are drier than that of the others, judging from the arrangement of its leaves and the character of its contents the food undergoes a

squeezing process by which excess of water, which might unduly dilute the digesting fluids of the true (fourth) stomach, is forced out.

The process of rumination. After the food has been chewed (masticated) for the first time, it passes down into the paunch and honeycomb, while fluids and finely chewed particles go on to the manyplies and even to the true stomach. The openings between the second and third compartments is small. Food in the paunch and honeycomb is slowly churned and thus thoroughly mixed with saliva, mucus and water, thus being rendered fit for the second chewing; probably the starchy matters of the food are changed to sugar, the right conditions, temperature and moisture being present in these organs. The compartment from which the food enters the gullet is not certain; from the construction of the parts it is likely from the honeycomb.[1] As soon as the bolus of food re-enters the mouth a sound is heard which indicates the downward passage of the fluid which lubricated its upward passage; in cattle the various movements in the gullet can be seen along its course down the neck. The necessity of an abundant supply of water or watery food is at once understood when the act of rumination is studied. It has been calculated that about seven hours are necessary for rumination, hence continual activity or work are not favorable to the ruminating process. The position assumed by the ruminant when resting is characteristic. The saliva is essential to the chewing of the

[1] As a result of postmortems made by the author, this view is held to be correct, judged mainly from the character of the contents of the gullet and honeycomb at the time of death, the gullet generally being found full of chewed material.

cud. When the food is completely remasticated it is swallowed, passed to the manyplies, and from there to the fourth or true stomach, to be acted upon by the gastric juices.

Vomiting in horses and other single-stomached herbivora is a rare occurrence, and when it does happen in the former is a grave symptom. The openings into the stomachs of these animals are close together, and as the gullet is closed by a sphincter muscle, if pressure is applied, the contents escape into the intestines. In the horse the stomach is never in contact with the abdominal muscles, consequently the necessary pressure cannot naturally be applied. In ruminants the contents of the true stomach do not return to the mouth.

2. Secretion. Having discussed the preparatory stages through which the food is put, and the organs employed in the process, under the second heading *secretion* — those organs and their secretions that have a digestive action, namely, the stomach, small intestines, liver, and pancreas will now engage our attention.

The arrangement of the mucous membrane in the stomach of the horse is such that to all intents and purposes it might be considered as two different organs, the villous or true digestive coat, containing the gastric glands. The stomach movements tend to mix the gastric juice thoroughly through the food, thus ensuring the digestion of its contents. The stomach of the pig resembles that of the horse; the fourth compartment *only* of the ruminant stomach is concerned with secretion. *Gastric juice* is a thin, limpid fluid, almost colorless, with a strong acid reaction, due to the presence of muriatic (hydro-

chloric) acid, it has an odor peculiar to the animal from which it is got. It prevents putrefactive changes and contains two ferments — *pepsin* and the *milk-curdling* one, some free *acid* (HCl) and mineral salts. The milk-curdling ferment is the active principle in *rennet*, is very powerful and may be found in watery extracts of the stomach of calves or sheep. Gastric juice acts on albuminous (proteid) material *only*, the fats and carbohydrates are reserved for the action of the intestinal juices. It is entirely unexplained why the stomach does not digest itself during life, after death such does occur. Gastric digestion in flesh-eaters (carnivora) is more active than in the herbivora, due to the large quantity of pepsin and acid contained in the secretion. Pepsin will not work in an alkaline medium, hence the acid, as it will be remembered that saliva was alkaline, and therefore unless neutralization took place, digestion would be very imperfect. Albumen becomes more indigestible when cooked: dogs often suffer from a fetid diarrhœa due to boiled meat, which is soon corrected by feeding the raw article.

Digestion in horses is characterized by the *slowness* of the preparatory mechanical stage of digestion, and by the *rapidity* with which the work of the stomach is performed, the rapid passage of the liquid material into the cœcum (blind gut) and the hardness of the ball-like form of the residue in the back parts of the bowel. Chewing the food is a slow process in the horse, and is completed at the time of the meal, consequently the amount of hay eaten is limited by the time, four to six pounds being the maximum quantity eaten in an hour,

should the teeth be in poor shape the time required will be about two hours; the same weight of oats require twenty to forty minutes. Chopping feed does not help animals with sound teeth; it will economize time; on the other hand, it is said to be harmful by decreasing the amount of saliva poured out. If *food* is given *in excess*, little of it will spend sufficient time in the stomach, it will be rushed on into the intestines, unfit for absorption, consequently will *act* as a *foreign body*, and as a *result*, cause a typical case of *colic* or *acute indigestion;* such results are every day occurrences in the practice of the veterinarian. The stomach will be filled and emptied once to three times during a meal, and is most active when about two-thirds full. Gastric juice in the horse besides containing the constituents already noted, has a ferment known as the *diastatic* ferment, which has the power of converting starch into sugar, such action is most active during the first two hours of digestion. In the stomach, as a result of the action of the juices, the albumen of the food is *peptonized*, a process which renders that material capable of being absorbed. The amount of peptone increases after a meal and reaches its maximum three to four hours later. Meals, therefore, must not be crowded too closely together or the results will be the same as if an over-amount of food had been given. Experiments have shown that if oats are fed first, followed as soon as eaten by hay, that they will be forced into the intestine undigested, therefore, the better plan will be to **water and hay first, following with oats** later. In the true stomach of the ruminant, albumen is converted into peptone, milk is coagulated and its

casein peptonized, gelatin is converted into an available form, some of the fats are split up, cane sugar being but slightly acted upon.

Gastric digestion takes place in the stomach, is the most complete in the ruminant, in which intestinal digestion is simple. In birds the food is macerated (softened) in the crop and mixed with an acid fluid, the crushing or grinding being done in the gizzard; the digestive process is very active and thorough in birds. The food having undergone the action of the stomach juices is then passed to the small intestines, where it meets the bile, pancreatic and intestinal juices. The small intestines are tube-like in form and of a musculo-membranous character, in the horse measuring over one hundred feet in length. They are divided into three portions, named respectively, the Duodenum, one foot in length, Ileum and Jejunum. The first section is fixed and has an opening into it, *the ductus communis*, which conveys the secretions of the *liver* and *pancreas*. The other portions are hanging free in the mesentery (a double fold of the peritoneum). The small intestines are lined with mucous membrane, which contains glands and *lacteals*. These lacteals originate in finger-like projections of the mucous membrane, known as villi. Those glands which have to do with secretion, with which we are now concerned, are the liver, spleen and pancreas. The *liver* is the largest secreting gland in the body and is situated behind the diaphragm. The function of the liver is to secrete *bile*, a fluid greenish-yellow in color and bitter to the taste. The liver is brown in color and is enclosed in a membrane known as Glisson's capsule, which sends in

leaf-like processes between the lobules; each lobule is made up of blood vessels, liver cells and ducts. There is a peculiarity about the blood supply of the liver, coming as it does by two vessels, the hepatic *artery* fetching blood to nourish this important organ, *the portal vein* bringing functional material from the intestines, namely, blood, to be acted upon. The hepatic *vein* conveys away the purified blood from the liver and empties it into the general circulation. The hepatic *duct* conveys the bile from the liver and joins the duct of the pancreas before discharging its contents into the intestine. In cattle, sheep and pigs the bile is stored in what is known as the *gall bladder;* the horse has *no* gall bladder; bile becomes concentrated in the gall bladder. In the horse the secretion of bile seems to be continuous, a maximum amount being secreted three to four hours after a meal, food exercising an influence on the quantity. Fats are acted upon by the bile, being split up into fatty acids and glycerine, emulsified and then saponified, in which state they are capable of being absorbed. **Bile** has a mildly purgative action; its suppression is revealed by constipation, stinking feces and yellowness of the mucous membranes. A secreting gland of even more importance than the liver is *the pancreas;* the reason of such importance is owing to the fact that its secretion, the pancreatic juice, contains ferments which are more powerful than those secretions (the saliva, gastric juice and bile) heretofore discussed, yet such being the case there is a relation between bile and pancreatic juice. Bile being alkaline neutralizes the acid (it will be remembered that the stomach contents were acid) and thus assists the pancreatic secretion,

which in its turn liberates the fatty acids before mentioned. The organ secreting the abdominal saliva, as the pancreatic juice has been called, is known as the pancreas; it is of a reddish cream color, and is situated behind the stomach and liver and in front of the kidneys. Its duct (Wirsung's) joins that of the liver in the horse, not in cattle and sheep. **Pancreatic juice** is a colorless alkaline fluid of a varying compositon, depending on the state of secretion. This juice contains a large amount of solids and is readily decomposed, the process being evidenced by the fecal odor. It contains *four* ferments, one that acts on *starch* (amylolytic), one that acts on *proteids* (proteolytic), a *fat splitter* (into fatty acids and glycerine) and a *milk curdling* ferment, similar in action to rennet. The first ferment converts starch into sugar, thus duplicating the work of the saliva; it is, however, much stronger than ptyalin (the active principle of saliva). The action of the second is similar to that of pepsin (the active agent in gastric juice), differing only that while pepsin needs an acid medium to work in, this ferment, *trypsin*, requires an alkaline medium. Pancreatic rennet is more active than that of the stomach; boiling, however, destroys the power of the ferment. The secretion of pancreatic juice is constant in the animals being dealt with (herbivora), and is at its maximum towards the end of rumination. In addition to the secretions mentioned, is that of certain glands (Lieberkuhn and Brunner) of the intestines, known as intestinal juice (succus entericus), which has an action similar to the pancreatic juice. It is readily seen that intestinal digestion is very important, owing to the complex nature

of the secretions employed, especially so in the horse, through whose stomach a great deal of the food often passes in an undigested state. So far the secretions mentioned have acted upon the more valuable parts of the foods and rendered them capable of being absorbed, yet the food of farm animals often contains a lot of fibre (cellulose) to dispose of which nature has provided ways according to the animal.

The blind gut (cœcum) the first part of the large intestines, assists in the disposal of the *cellulose*, in ruminants the cœcum is not as large as in the horse, the needs are not so pressing owing to the work done in the large paunch. The cœcum is very small in man and the dog, as would be expected from the nature of their food. In the horse its structure resembles that of the small intestine, possessing as it does glands and follicles. Its action is alkaline, normally, so that it is quite probable that considerable intestinal digestion takes place there (Smith); it is likely the place where cellulose is digested. As may be observed by any one, the poorer the food, the greater the belly development,—generally termed—paunchy; this condition is doubtless due to the fact that the poor quality of food has caused the use of much of the cellulose, consequently the cœcum has been developed to meet the necessity and as a result an enlarged abdomen; the feeding of such bulky or woody food is very undesirable in the horse, resulting as it often does in Heaves.

Before proceeding to the subject of Absorption, a large ductless gland, *the milt* or *spleen* calls our attention. It is a soft reddish sickle shaped organ lying on the great curvature of the stomach: is very elastic, therefore

distensible, its function, however, is unknown. It is surmised by some that the blood plates (corpuscles) have their origin in the spleen, by others that the spleen is the graveyard of these corpuscles; be that as it may, in certain diseases (Anthrax, Actinomycosis, Glanders) the condition or appearance of the spleen is of value in the recognition (diagnosis) of the disease. It has been stated that the entire digestive tract is lined by mucous membrane.

Absorption. *The lacteals* originate in *villi*, finger-like projections of the mucous membrane, which tend to give it a pile. Each villus contains blood vessels, nerves and lymphatics; to illustrate introduce a finger into a glove, the glove material represents the mucous membrane, the glove finger a villus, and the finger the blood and lymphatic vessels and nerves. These villi are most abundant in the small intestines, a few being found in the blind gut (cœcum) and a few in the large gut (great colon). The cæcum is situated in the right flank of the animal, is quite large, is directed downwards and terminates by a blind extremity; it receives two openings, one from the small intestines which is guarded by a valve, the other from the large colon. The great colon occupies the central portion of the abdomen, is arranged in four parts, two of which lie on the other two; its external surface is marked by strong muscular bands.

The taking in of the prepared food products is performed by the blood vessels and the lacteals, which constitute the entrance to *the lymphatic system*. The great colon acts as an organ of absorption in horses; digestion does not take place in the colon, although absorption

may. The special organs having to do with absorption are the lymphatics, the lacteals being one form of them, they originate in the mucous membrane of certain parts of the intestines, carry and eventually empty into the blood the products of digestion, which thus become available to the body. Fat is said to be absorbed as the result of a selective action of the lymphatic cells. The material taken into the blood by the lacteals is known as **chyle.** Absorption then is the entrance of digested food products into the circulation via the blood or lymph channels; why these products should enter in is not fully determined; it is held by some investigators to be due to the *selective* or *vital* action of the lymph cells

CHAPTER IV.

EXCRETION.

The expulsion of waste products from the body is by means of *a*, the feces (dung); *b*, the urine; *c*, the sweat; *d*, respired (breathed) air, and is termed excretion.

A. By the feces (dung). In the description of the digestive tract the food had to be taken as far as the great colon, where it was stated some absorption might take place, from there back, however, the remainder of the food ingested cannot be acted upon for various reasons, such as the previous extraction of all the nutritive matters, etc. The division of the intestinal canal behind the great colon is *the floating colon*, located in horses in the left flank, in cattle and sheep the upper part of the left flank is occupied by the paunch. This colon has a number of tightenings (constrictions) in its walls, due to certain circular muscular fibres. It will be remembered that the entire intestinal tract is a musculo-membranous tube, and that long and circular muscular fibres enter more or less into the construction of it. It has also been stated that muscles contract and relax, hence it would be expected that the intestines would have a certain amount of movement, such is true, there is a constant worm-like motion in the intestinal walls during life unless paralyzed; such movement is known as *peristalsis*, or the peristaltic, (vermicular or worm-like) movement of the bowels. As a result of this movement

of the long muscle fibres, together with the contraction of the short circular muscle fibres, the waste material is passed back and is given a more or less ball-like form. It is in the floating colon particularly that the feces (dung or waste material) take their form. The next portion of the canal is the *straight gut* (or *rectum*), an organ with thick dilatable walls; it lies above the bladder in the male, in the female above the vagina and uterus. Its location will thus account for the passage of feces via the vagina and vulva, a serious condition, usually the result of accident during copulation (mating) or parturition (the act of bringing forth the young). The point of exit of the feces is known as *the anus*, which is made up principally of circular muscular fibres, the action of which is to close the opening and thus prevent the involuntary passage of feces. In certain forms of paralysis the anus is not under control, consequently the feces pass away at all times. The process of emptying the rectum is known as *defecation* and is performed by contraction of the abdominal muscles and relaxation of the muscular fibres of the anus. The anus tends to recede and become less tense with age. Horsemen speak of a horse being "well buttoned up," a desirable condition, evidencing good nervous and muscular tone, the expression refers to the condition of the anus. When making the examination the tail (dock) is lifted, a flabby tail is very undesirable, but a strong dock, as it is termed, is another indication of tone, showing that the muscles of the tail have strong contractile power; allowances will have to be made for horses that have had their tails "nicked," an

operation in which the muscles that pull the tail down have been cut.

The rectum is largely used by veterinarians as an organ by which certain medication (injection, etc.) can be performed upon the animal, feeding is rarely attempted in animals by this means; it must, however, be remembered that the mucous membrane extends throughout the digestive tract as far as the anus, and also that the membrane is delicate and easily injured. A cruel practice followed by some grooms is known as "figging" and consists of the introduction of irritants (usually ginger) into the rectum; the object being to give a false life to a slow, slouchy animal or to excite him so that any lameness is hidden, or to render the horse so irritable as to prevent a fair examination.

B. The Urine. The consideration of the second method of excretion calls for a description of the organs—the kidneys, ureters, bladder and urethra—which perform this useful work. *The kidneys* are two glands situated to the right and left under-sides of the spinal column, the right kidney being situated just behind the last ribs, the left one being a couple of inches further back. In the horse they are heart or bean shaped, in cattle and sheep each one is somewhat divided into a grapelike mass. In front of the kidneys and attached to them are two glands (suprarenals) whose function is unknown, unless they perform work during the period before birth. Blood vessels and nerves enter the kidney at a depression or spot called the hilus; these vessels, nerves, connective tissue and urinary tubes (tubuli uriniferi) go to make up the kidney substance which is enclosed by a fibrous cov-

ering. The small tubes wind a great deal and empty into a cavity known as the sinus, which is a widening out of the ureter. Blood is supplied the kidneys by the renal artery and removed by the renal veins. If a section of a kidney is made, two portions together with the cut ends, etc., of vessels and tubes, are seen; the outer part being known as *the cortex*, the inner the *medulla*. The kidneys afford the main road for the throwing out (excretion) of broken down nitrogenous material, the ammonia being evidence as to the character of the waste material. The secretion of urine may be considered as a filtering out of waste products from the blood, water being its main constituent; in addition to the filtration process, the kidney cells have a selective action, and take certain substances from the blood which they change somewhat and later discharge into the urine. *The amount of the urine is inversely as the sweat;* more urine is passed in cold weather than in warm weather, due to the greater blood pressure in the kidneys at that time (e. g., winter). The urine of carnivora (dogs, etc.) is acid, clear, has more solids and is small in quantity, whereas that of herbivora is turbid, poor in solids, alkaline in reaction and great in quantity. When horses are fed hay or straw only the urine is alkaline, when fed oats principally, the urine is small in quantity, turbid, acid and sticky. The urine of cattle and sheep is clear, greenish yellow in color and poorer in solids than that of the horse; that of the pig is clear, yellowish and alkaline. Two tubes originate in the depressions of the kidneys and go to the bladder, one entering on either side; they go through the coats of the bladder on the slant, thus

forming a valve which prevents the urine passing back to the kidney; the tubes are known as the *ureters*. *The bladder* is the urinary reservoir situated in the pelvic cavity, although when full it may extend into the abdominal cavity. It is divided into a fundus (the wide part) and neck which is continuous with the *urethra*, the latter the tube carrying the urine to the outside of the body. The exit from the bladder is guarded by a circular (sphincter) muscle, which by its contraction prevents the trickling of urine continuously. The coats of the bladder are three in number, serous—externally, muscular or middle coat—and mucous—internally. The urethra in cattle and sheep differs from that of the horse, in the former having an S-shaped curve, whereas in the latter it is straight. The urethra in the female of these animals opens on the floor of *the vulva*, at a short distance (3 to 4 inches) from the outside of the body. In cows the entrance to the urethra is guarded by a valve-like piece of skin, which must be lifted in order to pass the catheter. The difference in length and construction of the urethra in the sexes accounts for the greater frequency of stones (calculi) in the bladder and urethra in males. When the bladder becomes filled the mucous membrane comes in contact with the urine, a nervous impulse is sent to the brain and as a consequence the neck (sphincter muscle) of the bladder is relaxed, and the urine is passed, the whole constituting a good illustration of reflex action, the exercise of the will power not being called for. The urine is made use of by chemists and medical men, by the former to estimate the amount of nitrogenous material used or wasted in the body, by

the latter to determine the disease, if any, in the person or animal, the operation being known as urinary analysis.

C. The Sweat. The importance of the *sweat glands* and the sweat as an avenue for the exit of waste matter varies in the different animals. The sweat, and we may as well include the *sebaceous glands*, are appendages of the skin. The sweat glands consist of coiled tubes imbedded in the skin with an outlet at the surface (pores); the sebaceous glands are also found in the skin at parts most exposed to friction, they discharge a fatty substance into the hair follicles. The sebaceous secretion is most abundant on the parts covered with hair or wool. The *yolk* (oil) in sheep's wool is the product of the sebaceous glands; it consists of the broken down cells of the gland and gives the oily appearance to the fleece. Ill health causes changes in the yolk, which are at once evident to the shepherd. This oiliness can be got in the coats of horses and cattle by good feeding and grooming. In certain breeds of cattle this secretion is very yellow in color and is much desired, as it is considered an indication of the tendency to secrete rich milk (?), the inside of the ears are in cattle generally given a cursory glance to determine this fact. In sheep a pink condition of the skin is desired, a dead white or blue color indicating ill health.

Sweat glands are highly developed in man and the horse, in the latter especially on the inside of the thighs, as also in sheep, in cattle little sweating is done. Carnivora (dogs and cats) sweat through the soles of their feet. The amount of sweat is modified by the food, drink, condition of the atmosphere and amount of exer-

cise. Perspiration (sweat) is spoken of as sensible or insensible, in the former is visible; in normal conditions sweat is being excreted continuously. Formation of sweat depends on the activity of the gland cells, therefore increase of the blood supply to the skin would mean increased sweating. More water and more solids are excreted by the skin than by the lungs. The trotting horseman, as the result of experience, seems to appreciate the work of the sweat glands more fully than any other class of stockmen, as is evidenced by the thorough attention given to their charges when training or racing, in any case thorough grooming at regular and frequent intervals is necessary to prevent dried sweat and dead skin scales from blocking the exit (pores of the skin) of the sweat glands. An experiment conducted to show how necessary to the good health of the animal open pores are, consisted of the varnishing of the entire body of the animal—death resulted.

D. Respired Air. This form of excretion borders so closely on the inspiration (taking in of fresh air—one form of food) that the description of the organs performing this work will be discussed separately.

Breathing (respiration) consists of the taking in of pure air, charged with *oxygen* (the life-giving gas), and the exchange of that oxygen for *carbon di-oxide* (a poisonous gas), the exchange taking place in the lungs. The blood is brought into intimate relation with the air in the lungs, therefore we find that as a result of such contact the blood becomes charged with oxygen, thicker in a sense, of a deeper red color, and discharges carbon di-oxide and heat, the latter the result of the exchange of

the one gas for the other. Here then we have in a nutshell the reasons for ventilation: (1) to remove impure air and (2) fetch in pure air, and by carrying out these two important things give (3) the means of warmth to the animal.

The processes of taking in food, using it and discharging the waste, have been described, there remains, however, the consideration of the respiratory (breathing) organs—dual-purpose in character—because, as intimated above, not only do they remove the waste poisonous gas (carbon di-oxide), but also are the means by which that valuable gas—**oxygen,** without which no animal life can exist, is brought into the system.

The Organs of Respiration. The organs going to make the respiratory system are the nostrils, nasal cavities, pharynx, larynx, trachea, bronchi, bronchial tubes and lungs. The *nostrils* are situated at the anterior extremity of the nasal chambers, they are made up of cartilages, which are dilated by muscles, and lined by mucous membrane. At the upper part of the nostrils are two blind pockets, called false nostrils; just inside the nostrils are small openings, the point of exit of tears, brought from the eyes by the lachrymal duct. A large nostril is much desired, as the nostrils control the amount of air taken in. The nasal chambers are two cavities separated by a piece of cartilage (gristle), the septum nasi, in each cavity are thin delicate curled bony plates, the turbinated bones, covered with mucous membrane, which is thin and contains delicate blood vessels, consequently the air is warmed as it passes over these bony plates before being taken into the lungs. Fine nerves, constituting the

organs of smell, are also distributed in the nasal mucous membrane. This mucous membrane is a pale delicate rose color, the color and condition of the mucous membrane are valuable aids in the recognition of diseases. The sinuses of the head communicate with the nasal cavities, evidence of which can be seen in cattle just after removing the horns. The pharynx, just behind and below the nasal cavities, is common to both respiratory and digestive tracts and has already been described. The *larynx* or voice box has been termed a musculo-cartilaginous valve, being made up of muscles, cartilages seven in number, ligaments, and the *vocal chords*, the organs of voice. Mucous membrane lines the entire respiratory tract. The muscles of the larynx have control of its movements, such as widening or narrowing its capacity by tightening or relaxing the vocal chords. In the disease known as Roaring there is wasting of the muscles that control the chords, consequently the calibre of the tube is smaller than required when the horse is put to severe exertion, such as racing or drawing heavy loads. One of the cartilages of the larynx acts as a lid to the voice box, and thus prevents food particles falling into the larynx when on the way to the gullet. This being the case it will at once be seen *why* when drenching animals only *small quantities* and *plenty of time* should be given; if large amounts are poured down rapidly the lid becomes raised to allow the animal to breathe and the fluid passes down "the wrong way," that is, into the windpipe; this will also occur if the tongue is pulled forward during drenching, as such pulling tends to raise the lid up and thus open the larynx, with the result quite often of the death of the animal.

Immediately below the larynx is the windpipe (trachea), a flexible tube made up of rings of cartilage, ligaments, etc.; lying just above it is the gullet (esophagus). *The thyroids*, little reddish round bodies on the sides of the windpipe just below the jaws, are of interest, owing to the scientific curiosity as to their functions, which up to the present time are not known. Enlargement of these glands occur in animals, the condition being known as **Goitre,** very often a **serious** trouble **in breeding ewes,** serious because the **progeny** of such ewes **die at** or soon after **birth.** The *thymus gland* or *sweetbread* while well developed in the young animal tends to disappear, shrivel up, as the animal grows older. It is interesting to note the demand for this gland, seventy cents a pound, wholesale, being obtained for it in Chicago — that is, for calves sweetbreads; two-year-old sweetbreads are not as valuable, they eventually turning into fat.

The *trachea* or windpipe is located in the region of the neck, and at its lower end enters the chest cavity, where it divides into smaller tubes (the bronchi), which again divide into still smaller tubes (the bronchioles), these end in little pockets or sacs (the air cells of the lung). The mucus membrane of the trachea has numbers of cells possessed of wavy tails, known as cilia. These cilia have a continual motion from within outwards, so that if mucous or some foreign particles get into the windpipe, by the motion of these cilia, this material is thrown out.

The blind pockets or air vesicles of the lungs are formed of a very fine membrane surrounded by very delicate blood vessels. These air cells, the small bronchioles, blood vessels and nerves go to make up the

lungs, which are spongy organs of a rosy flesh color, somewhat marbled in appearance; the right lung is somewhat larger than the left, the latter being encroached upon by the heart. A healthy lung will float in water. The lung substance in the natural state is very elastic and requires plenty of room for expansion: pressure on the lung tissue, due to a lack of room, the result of such causes as overfeeding, feeding bulky innutritious feed, sometimes ends in rupture of some of the air cells; this condition prevents the performance of the natural lung work and as a disease is termed Heaves.

In connection with the lungs the pleura, one of the serous membranes, commands attention. The *pleura* has two layers, one covering the lungs, the other lining the inside of the ribs; between the two layers is a small space. The two layers of the pleura, in health, glide over one another without friction, being oiled by the secretions, as a result of inflammation, the layers become dry and pain is the result; later on an excessive discharge of fluid may take place, constituting water in the chest (hydrothorax).

CHAPTER V.

THE PROCESS OF BREEDING.

Reproduction. The reproductive function in animals is one of great moment to the stockman, because according as their fecundity (fruitfulness) is above or below the average, so will his income likely be above or below the average. In ordinary cases a knowledge of the anatomyand physiology of the generative organs is not needed, but in the *extraordinary* cases—such as disinclination to breed, retention of the afterbirth or other unnatural conditions—such knowledge is absolutely essential to the stockman's financial success.

The generative process may be considered as one of the ordinary methods of growing farm crops. The element (semen) of the male constitutes the seed, the womb (uterus) of the female the soil in which the seed is planted, under natural conditions, the crop (offspring) is assured. The generative organs of the male are quite different to those of the female in appearance, yet analagous in their origin, for example, the clitoris in the female corresponds to the penis, the ovaries to the testicles, and so on.

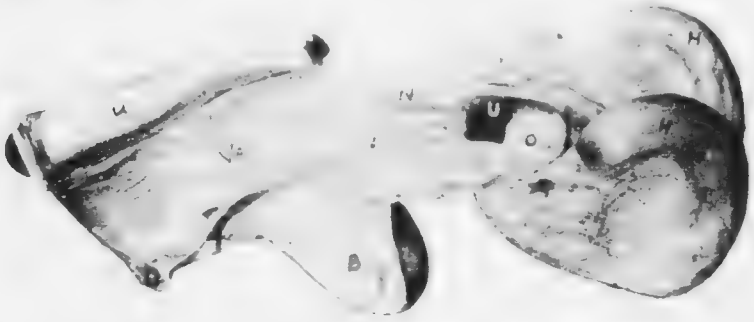
The Male Organs. The cod, bag, sac (scrotum) contains the stones or testicles, and is located between, or behind (as in the pig) the thighs. It has several coats derived from the skin, and from some of the abdominal muscles, externally it shows a line or raphe, thus divid-

ing it into two halves. **The testicles** are two egg shaped bodies placed horizontally in the horse, vertically in cattle and sheep. They are made up of a number (200–300) blind tubes in which is secreted the sperm or semen. The spermatic cord, made up of blood vessels (it is important to remember in castration that the artery of the cord is situated at the front part of it), nerves, serous membrane, lymphatics and a muscle, the cremaster (which withdraws the testicle up into the inguinal canals at castration), the vas deferens (a tube conveying the semen to the penis), suspends the testicle in the scrotum. This spermatic cord is located in what is known as the inguinal canal, entrance to which is obtained through two slits in the abdominal floor; previous to birth the testicles are up in the body, later on they descend through the rings (openings of the canals). In exceptional cases the testicles do not descend, in such cases the animal is known as a ridgling, original (cryptorchid) and is often vicious and hard to control. The *penis* is made up of the urethra, which is situated on the under surface, and erectile tissue, the latter being made up of blood vessels which become engorged with blood during sexual excitement, the erectile tissue forms the glans or head. **The sheath** (prepuce) is a fold of loose skin that envelopes the penis, it is the location of numerous sebaceous glands. *This organ requires careful examination at intervals*, or if allowed to become dirty or clogged the passage of the urine is more or less hindered, due partially to the castrated male (gelding, steer or wether) urinating in the sheath. The noise made by horses when trotting, is due to the air rushing into the sheath. In bovines the penis

is long and thin, the sheath longer than in the horse. The peculiarity in the male organ of ruminants (cattle and sheep) is the S-shaped curve which permits of rapid extension of that organ, but prevents the passage of a catheter. The end of the penis of the ram is marked by a small thin projection, the *worm* as it is called by shepherds; the removal of this worm (often performed in Great Britain to prevent the stoppage of small stones in the urethra) is said to render a ram infertile. (?)

The semen (spermatic fluid) is a sticky white fluid with a peculiar odor; it contains numerous little objects with ovoid heads and wavy tails known as *spermatozoa*, by means of the wavy movement they are enabled to make their way up the fallopian tubes of the female.

The Female Reproductive Organs are the ovaries, fallopian tubes, womb (uterus), vagina, vulva. The *ovaries*



GENERATIVE ORGANS OF A MARE (AFTER AUZOUX).

R, rectum; Va, vagina; B, bladder; N, neck of the womb; U, womb or uterus; H, horns of the womb; O, ovary.

are situated below and behind the kidneys, fastened to the uterine ligament; they are bluish or reddish white in color, and although smaller, resemble the testicles in shape. The ovaries are the birthplace of the ovum (egg).

Two crooked tubes, one from each ovary, convey the ovum to the horns of the womb, these tubes are lodged in the folds of the broad ligament. **The womb** (uterus) is a musculo-membranous organ with very distensible walls, situated in the pelvic cavity and below the loin and croup. The uterus is said to have a body, horns and neck (*os*). The horns (in the mare) are directed upwards

WOMB OF A COW (AFTER AUZOUX).

C—Cotyledons or buttons, the afterbirth is partially stripped off two of the upper ones.

and forwards, in the cow downwards. The back part of the womb is narrowed to form the neck (os) which projects into the vagina. In the mare the womb lining is comparatively smooth, whereas in the cow the mucous membrane lining the uterus shows rounded elevations—

buttons or *cotyledons.* The womb of the ewe is similar to that of the cow, the horns being longer, as they are also in the sow. The *vagina* is the passage connecting the womb and the vulva; it is the organ of copulation and permits the passage of the offspring. The *vulva* is the external opening of the genito-urinary tract, appearing as a long ovoid slit below the anus; on the floor of the vulva is the entrance to the bladder, and also the clitoris (composed of erectile tissue).

Reproduction is accomplished by the union of two individuals of the opposite sexes.

Heat, Rut, Oestrum are all terms used to describe the natural mating period, at which time the ovum (egg) is developed in the ovary, and passed from thence to the uterus, where if it meets the male element may become fertilized and undergo development into the offspring. This formation of the ovum does not occur until a certain period, known as *puberty*, which is manifested by the first appearance of heat, the signs of which are swelling and reddening of the genitals, flow of reddish, peculiar smelling discharge, frequent attempts to urinate, restlessness, bellowing and seeking of the male, mounting other animals, spasmodic movements of the clitoris are evidenced during the erotic period. The condition of rut or heat becomes more frequent with domestication.

The time elapsing between the periods of heat varies in the different animals, occurring in the mare at intervals of eighteen to twenty-one days, in cattle about every three weeks, ewes every sixteen to seventeen days, sows fifteen to twenty-one days. **Mating** will only be permitted during the period of heat. The time available for

mating also varies in animals, the average duration of heat in the mare is two to three days, in the cow fifteen to thirty hours, ewe two to three days, in the sow one to three days. The presence of the male is often required to prove the existence of the heat. If conception takes place heat is not evinced again until after the birth of the young. The cow will come in heat four weeks after calving, the mare nine days after foaling; in ewes, except Dorsets and their crosses, breeding will not be allowed until fall, while sows show no signs of heat until after the pigs are weaned, although conception has been known to take place three days after farrowing. The time taken by the ovum to reach the uterus may be two or three days, in rare cases after becoming impregnated, the ovum has fallen into the abdominal cavity and there developed. Some animals are continually in heat; such is usually an evidence of a diseased condition of the ovaries. Puberty in the male is evidenced by the secretion of semen and the presence of the sexual appetite. The contact of the male organ, which must be erect, with the walls of the vagina causes ejaculation of the semen. One single spermatozoon is sufficient to impregnate an ovum, such being the case, numerous services during one heat should not be permitted except in special cases. Impregnation is as a rule only possible between animals of the same species; hybrids are the result of crosses between different species, such as between the donkey and horse, the mule being the result. Hybrids will not breed. Artificial breeding by means of the capsule method is useful in mares that are shy or difficult breeders, and in those who throw out the semen. (See Sterility, p. 178.)

When the ovum is impregnated it is carried to the uterus (if impregnation took place in the fallopian tube) and there undergoes the natural course of development, barring accidents, into the young animal. The period taken to ensure such development usually spoken of as the period of gestation, is on the average eleven months in the mare, nine months in the cow, five months in the ewe and she-goat, and four months in the sow. It is quite a common occurrence for any of those animals to run over the time mentioned.

Essentials to Success in Mating are: *Single services* by the male, except in exceptional cases, *plenty of exercise, liberal diet* of *flesh-formers*, and *maturity;* in the female the same apply. Although breeding is possible at puberty, which occurs in horses at one and one-half years, eight to twelve months in bovines, and six to eight months in the sheep and pig, it does not follow that it should be permitted; breeding from *immature* stock is one of the curses of the livestock industry.

At the time of mating both animals should be in a healthy condition. Mares are often exercised or bled just before service in order to insure conception. Up-to-date shepherds make a practice of flushing the ewes, as it is called, by feeding rape, oats, etc., for a short time previous to mating.

Success in mating depends *not* on the number of services, but on the vitality and age of the animals used; domestication has had its effects in the hands of intelligent breeders for good, as is seen by the improvement in live stock, and for evil also, judging by the mongrels, such as stallions, bulls, etc., permitted to travel the

country and perpetuate their kind. Breeding and breeds does not come in the scope of this work, but as the anatomy of the parts used has been described, the physiology of mating should also be understood, some of the visible signs have been described, so that the stockman knows how and when to utilize animals for his benefit, the question arises, how often should the generative act be allowed, and at what time of life should mating first be performed? While breeders differ to some extent, the intelligent progressive ones are a unit in decrying the use of immature dams and sires, the following sentences contain the kernel of the matter.

Stallions should not be used until two years old, at which time they may be mated with a dozen good mares so as to get an idea of their value as sires; at three years old may have forty mares; at four years old, sixty mares and up, numbers of stallions exceeding the century mark during a season, the handling during that time will be a factor in determining the percentage of live foals. Forty per cent. is considered a fair average of living foals, although often exceeded; it is stated that Rysdyk's Hambletonian foaled sixty-nine per cent. of his mares. The government stallions of France and Germany are not used until four years old, and are then allowed only four mares a day, as many as one hundred being covered during a season. The concensus of opinion seems to be that a mare should not be bred until she is three years old. The practice of good horsemen is to allow at least an interval of one hour between services, and seldom is more than one service given a mare in the one heat.

Before purchasing a stallion *always* see him serve a mare, much trouble will thereby be saved the purchaser and more satisfaction be derived from the purchase; many a fine appearing stallion is totally useless for stud duties.

Bulls may be allowed twenty five cows in a breeding season, although the practice of advanced dairymen of having cows coming in at different times increases the opportunities for the use of the bull's procreative powers manifold, the conditions under which such an animal is kept practically controls his ability as a sire; if fat and lacking exercise his powers are markedly deficient.

Heifers of the dairy breeds (Jersey, Guernsey, Holstein, etc.) are usually bred to come in at two years of age; breeders of beef type of cattle (Shorthorn, Angus, etc.) prefer to wait a year longer, if earlier their development is hindered and they are forever spoiled.

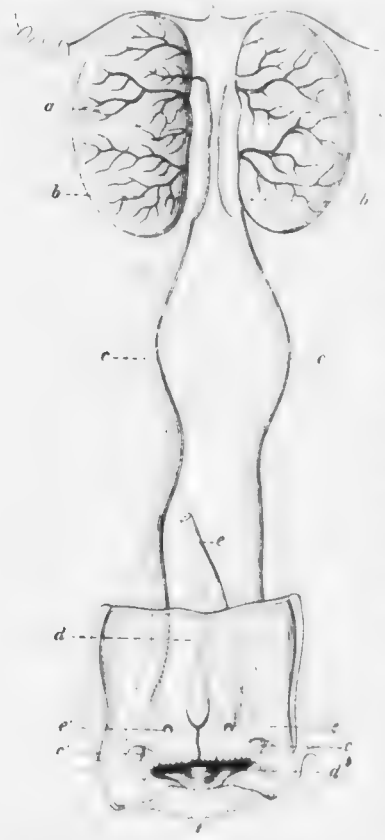
The practice with **rams** varies with the location to some extent, on the ranges a ram is alloted to forty ewes; if ram lambs are used, only six to ten ewes should be allowed; a better practice is to use no rams below the yearling age, which means in most flocks, eighteen months or thereabouts. The shepherd is so situated that he, of all the stockmen, can watch the results of overmating and the use of immature sires and dams, if such are used, or the ram overtaxed, the lambs come either weak or undersized; a ram whose powers are carefully husbanded, by turning with the ewes for a short time only each day, may have as many as sixty ewes in the breeding season, frequent services should not be allowed, only bad results follow, such as weakening of the ram.

Ewes are not usually bred until they have attained the age of yearlings.

A boar cannot be expected to be a successful sire unless he has reached the age of one year; the sow being bred to farrow at the same age; there is little danger of the average boar being over-taxed, Coburn, in his Swine Husbandry, recommends that five or six farmers combine to own a boar, each farmer being supposed to own a dozen brood sows.

The Digestive and Reproductive Organs of Poultry differ slightly from those of other farm stock. The gullet in poultry is quite long and presents a widening out in the neck known as the *crop*, in which is performed practically the same work as in the first stomach of cattle or by the saliva of the horse; lower down the gullet again enlarges to form the *proventriculus* (the first stomach cavity) where a fluid resembling gastric juice is secreted, to this succeeds a muscular cavity known as the *gizzard*. The gizzard is of interest because the work of grinding the food, ordinarily done in the mouth, takes place in this muscular cavity, the thoroughness of this grinding process depends on the presence of grit; such being the case a supply of grit is essential to the health of poultry. The powerful muscular walls of the gizzard by their action grind the food between the particles of grit found in that stomach. The intestines are shorter than in the other varieties of farm stock, and terminate in a tube known as the *cloaca* which is common to the digestive, urinary and reproductive organs. The testicles in birds are located under the back bone just in front of the kidneys, on a level with the origin of the last two pairs of ribs.

The excrement of poultry is, as all know, of two colors showing distinct portions. The white portion is the *kidney* secretion, the dark portion the *bowel* excretion. Experiments have been carried on to determine the length of time necessary to elapse before all the eggs of a flock of hens will be fertile after the placing of the cock with them, it has been found that an interval of ten days is about the time required, it has also been found that the same time must elapse after removal of the cock before all the eggs are infertile.



REPRODUCTIVE ORGANS OF THE COCK. *a, a*, testicles; *b, b*, epididymus; *c, c*, vas deferens; *d*, cloaca; *d'*, bursa of Fabricius; *e, e*, papillæ through which the vas deferens open; *f*, margin of anus.

Muscular development in poultry is mainly of interest in connection with its fitness for the table; we find that the same width of back and breast is desired in poultry as in other meat bearing stock. The breast, especially, should be well covered with meat to fully supply the demand of the meat market; to obtain such, plenty of exercise, pure air, good food and water are necessary, together with

URINARY AND REPRODUCTIVE ORGANS OF THE HEN.

a, ovary; *b*, infundibular portion of oviduct; *c*, portion of oviduct which secretes the albumen; *c'*, uterus or shell forming portion; *d*, intestine; *d'*, cloaca; *e'*, *e'*, opening of the ureters; *c''*, opening of oviduct; *c'''*, depression corresponding to the opening of atrophied oviduct; *g*, bursa of Fabricius; *f*, *f*, *f*, kidney divided into three lobes; *e*, right ureter.

the grit before mentioned, heredity has a powerful influence similar to its results in cattle. The time necessary for the bringing forth of the offspring varies according to the species, chickens are hatched out in three weeks, goslings, ducklings, and poults (the young of the turkey) in a month. The development of the chick in the egg, by the aid of the incubator, supplies the investigator with a large part of his knowledge regarding the development of the young animal in the womb, beginning with the time when the ovum was impregnated in the tube until it is expelled from the womb. The egg is kept at an average temperature of 103 degrees when in the incubator. **Formation of an Egg.** Fowls have only one ovary and one oviduct at maturity; from the ovary comes the ovum, consisting of the yelk enclosed in a thin membrane, at the upper part of the oviduct it is fertilized, it is then forced down the oviduct by contractions of that tube; during its downward course being coated with a dense layer of albumen, lower down the oviduct more albumen is added, the last albumen added being more watery than the first, then a thin film-like membrane formed of albumen is added; still further down, the small end outwards, it reaches the uterine widening where it is coated with a thick white fluid which hardens and becomes the shell. The color of the egg shell is got from the color secreting villi of the uterine cavity, the pores in the egg shell being the result of contact with those villi. The shell substance contains carbonate of lime with a little carbonate of magnesia, phosphate of lime and magnesia; food containing these materials or the materials themselves must

therefore be supplied to the feathered farm stock. The egg takes from four to six hours to travel from the ovary to the uterus, where it may stay twelve to twenty-four hours before being extruded as the egg of commerce.

Mating of Poultry. The same principles of mating apply to poultry as to the four-footed stock; therefore for breeding purposes a cock may be allowed ten to twenty hens, more than that number is unprofitable, the large percentage of infertile eggs complained of by many farmers is due to the overtaxing of the procreative powers of the cock. Pullets and year old hens are the most profitable layers, the breeding hens should be one year old or upwards, it is not advisable to hatch from pullet eggs. Ducks are usually paired or two ducks to one drake, the female may lay as many as 40 to 50 eggs in a season. The gander is usually given three geese, who lay two settings of eggs in a season, geese do not lay until one year old. Turkeys are slower in coming to maturity than other fowl, the tom (male turkey) should be from two to three years of age before mating to get the best results, five turkey hens are allowed to a tom; an interesting fact about the mating of turkeys is that one visit suffices to fertilize all the eggs (10 to 20) laid by the turkeys at one period, it is quite common for the turkey hen to lay twice in a season, the second lot are rarely fertile.

CHAPTER VI.

THE MILK GLANDS AND THEIR FUNCTIONS.

The milk glands are essential to the proper performance of the reproductive function. Man has however made use of the milk functions and developed it to such an extent that some cows are now specialists in milk production; the result of such specialization is that the milk glands have become larger, the milking habit more persistent, the quantity given greater and *the liability to disease increased.*

The Udder. The arrangement and construction of these milk glands varies in the different animals. The mare's udder consists of two halves each presenting a nipple or teat pierced by openings for the passage of milk: in mares that have never borne young the teats and udder are small, in old brood mares the udder and teats are large and flabby.

The udder of the cow is composed of two halves, each again divided so that we speak of the quarters of an udder; while in the ewe two glands only are present, each with a teat; in the sow the udder extends along the belly and has from eight to ten teats belonging to as many glands, arranged in two rows lengthwise. The interior of the gland is made up of gland tissue formed into lobes, each lobe being made up of smaller lobules, each of these in turn being made up of cells and small ducts. These ducts unite to form larger ducts, all of which gradually

converge to the center of the gland where they form cavities known as the milk sinuses, they used to be termed lactiferous (milk-making) sinuses.

The milk sinuses empty the lacteal secretion into the teats, each of which is guarded by a sphincter muscle at

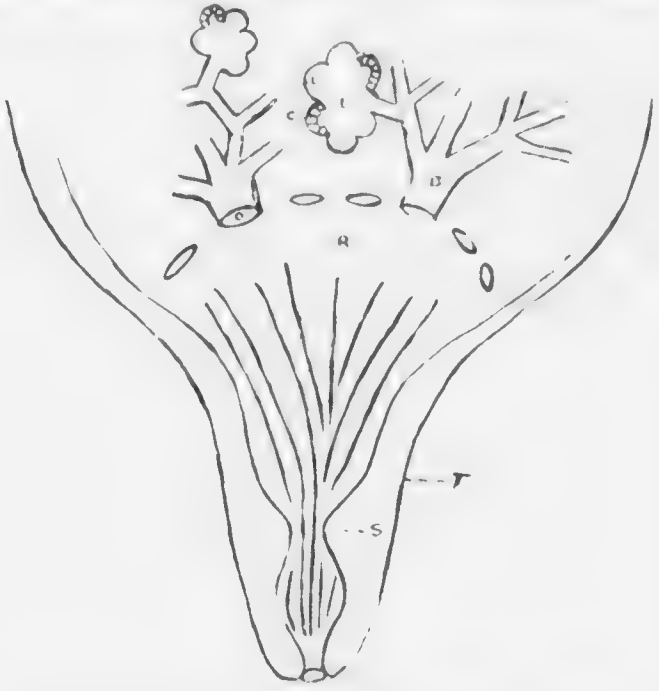
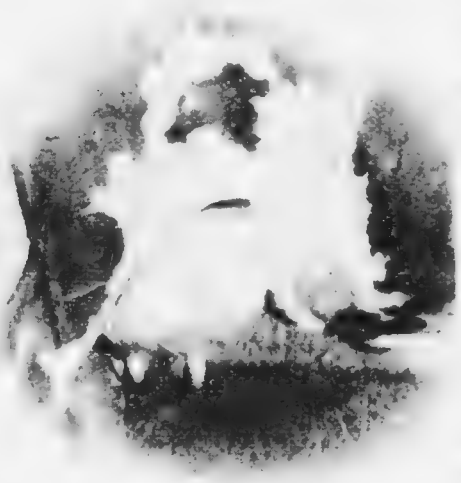


DIAGRAM OF TEAT AND ONE QUARTER OF UDDER.

s, sphincter muscle; *t*, teat; *r*, milk reservoir; *d*, the duct; *o*, opening of duct; *l*, a lobe; *l'*, a lobule lined by *e*, epithelium; *f*, folds of mucous membrane.

its lower end, it is this sphincter muscle which is so hard to relax in some cows, that causes them to be termed hard milkers. The udder is lined with a delicate cell structure known as *epithelium*, this cell structure extend- to the alveoli (lobules).

Shape of Milk Gland. It has been stated that the internal parts of the udder consist of cells and other structures; and as such, require the use of the microscope more or less in their examination, besides the cells, considerable connective tissue enters into the udder formation, the amount of such tissue materially affects the elasticity of the udder, as it does in muscle. The so-called meatiness depends on the presence of a large quantity of connective tissue, the presence of which cannot help but supplant gland tissue (secreting tissue), therefore we can understand why expert udder-judges want elastic udders on their cows. Prof. Plumb has made a series of studies of the external form of the udder and the relation of that form to usefulness. We cannot do better than note what he says regarding the matter: "A good type of udder will have its side-line, that of the curve of a circle, if a fine udder, it will be carried along beyond the lines of the circle, by an extension along the belly and up between the hind legs, such an udder with teats about three and one-half inches long, make a good type



A WELL-BALANCED UDDER.

as viewed from the side. Examined from the rear, there should be considerable thickness, the dividing furrow shallow and no meatiness, the good udder when milked out being fairly well shrunken." While the ultimate test of the milking ability will be the scales and the Babcock test, there can be no doubt whatever after a close study of the experiments of Prof. Plumb that the shape and construction of the udder are valuable indications towards getting a correct idea of the milking abilities of a cow. The above authority calls attention to the lack of fore udder in many cows and gives figures to back up his contention, that the best udder is the squarely-balanced, elastic-feeling udder, with a large blood supply. Certain breeds are deficient in this respect, the Ayrshire, however, being strong in foreudder development. There is much in heredity; many stock breeders examine the bull intended to head their herds, for the placing of the rudimentaries (small teats just in front of bag or scrotum) as they believe that such placing is an indication of the probable placing of the teats in his progeny, consequently they want the rudimentaries

A POOR UDDER.

squarely placed. Prof. Plumb puts the question "may not a material gain in milk-flow be secured by developing the foreudder?" The figures submitted by him in Bulletin 62, of Purdue University, certainly hold out testimony that such improvement may result

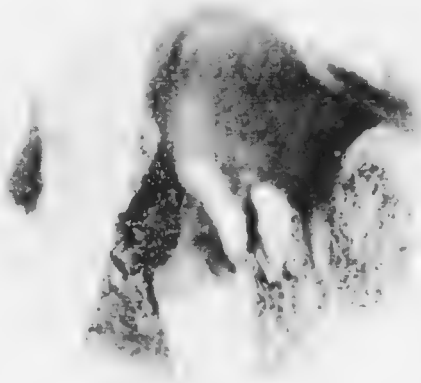
In heavy milkers the udder is often perpendicular; what is termed the funnel-shaped udder is not a desirable type, neither are udders with very large teats. It is interesting to note that no such irregularity of form is presented by any part of the anatomy of the horse, ox, sheep or pig, as shown in the milk glands of the cow. If one-quarter of an udder is diseased, the other quarters do not seem to take on the work of the resting quarter.

A GOOD FORE UDDER.

The function of the udder is to secrete milk, the stimulus to do so being the maternal function, thus the work of this organ differs from that of others in the body, in that its secretion serves no useful purpose to the animal secreting, but is intended to serve as a food on which to raise the offspring.

The secretion of milk is held to depend on a throwing off of the epithelial cells of the alveoli, combined with a filtering out of water, salts and other materials from the

blood; when that secretion takes place is yet a moot point, the opinion held by the best authorities is, that the secretion of the greater part of the milk goes on during the act of milking. It is now held that the nervous system has largely to do with the production of milk, a reasonable conclusion when we remember that the activity of a gland depends largely on its blood supply, that supply being controlled by the nerves, whose action is to contract or widen the blood vessels.



A FUNNEL-SHAPED UDDER.

Roehrig describes a nerve which leaves the spinal cord and goes to the udder, filaments from its branches go to the teats, the cisterns and the alveoli. When the teats are worked with the hands the nerves surrounding them are irritated, and through them the secreting glands are stimulated, causing their contraction and the discharge of their contents.

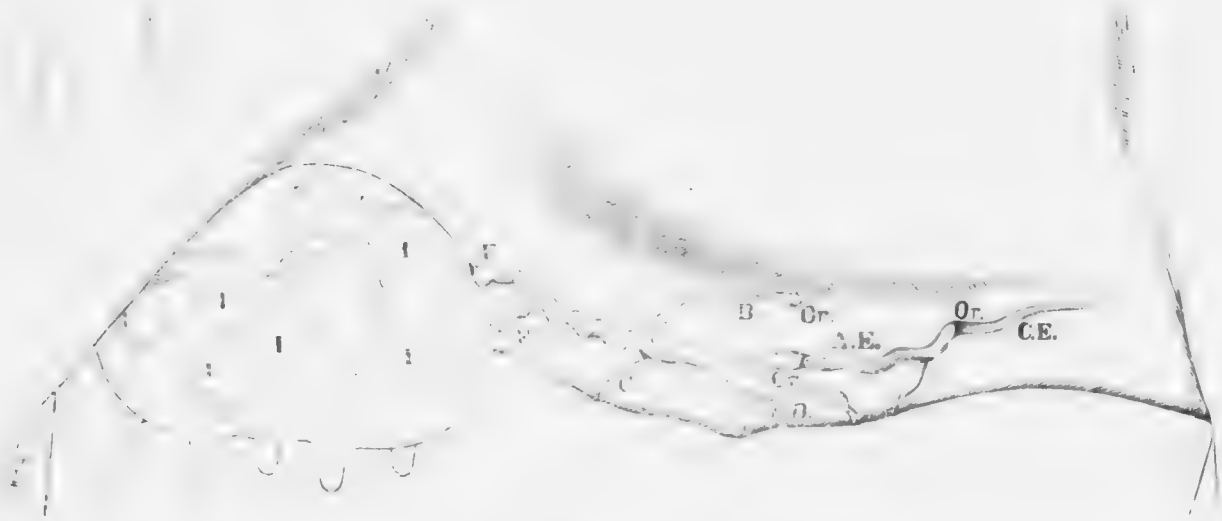
The veins along the belly leave the front of the udder and go forward in a more or less winding manner, branch more or less often, and eventually disappear through holes in the abdominal floor, termed milk-wells, then pass along on the inside of the upper side of the breast

bone, to be eventually united to the internal thoracic vein (the mammary vein of the human).

The mammary vein then will be accepted as affording some indication at least of the milking capabilities of a cow. Some breeders' associations call for certain arrangements of those veins, as follows: Single and double extension, single and double branches, single and double chest extension, or umbilical (navel) veins. The wells vary in number from one to three on each side of the animal; they should be of good size.

The greater the capacity of the arteries and veins connected with the udder, the larger the milk secretion will usually be. Theory and practice then seem to unite and back up the ideals of the dairyman, one of which is a great development of the mammary veins. The arterial supply cannot be seen, and only parts of the venous system of the udder are visible, viz., the abdominal veins and those underlying the skin of the udder, yet reasonable conclusions can be drawn from the development of the milk veins.

Holding up the Milk. Various theories have been advanced to account for this illustration of animal perversity and human peculiarity; the latter probably had been shown in the form of abuse, and of course, stamps the exhibitor as one not fit to own or milk cows. Wing, in "Milk and its Products," states that the holding of the milk is due to the presence of sphincter muscles at the branching of the ducts, and that this muscular tissue is connected with the abdominal muscles, which if contracted, as a result of fright, dislikes, etc., will cause the milk to be retained in the udder, or as it is termed



MAMMARY VEINS AND UDDER.

I. I. I. I. I. — Udder veins. I. I. — Forks of the right mammary vein. Or. Or. Or. — Orifices in which the mammary veins enter the abdomen on the way to the heart. B. — Branch vein. A. E. — Abdominal extension. C. E. — Chest extension. I. I. — Imperfectly developed portion of the mammary veins. C. — Connection between the two main veins.

the cow holds up her milk; so far I have been unable, either by dissection of udders or consultation of authorities on the anatomy and histology of the udder, to verify his statement. Furstenberg states that holding up of the milk is due to a congestion of the blood-vessels of the teat and gland, which is more tenable than the preceding theory, as it is well known that congestion interferes with the working of any gland.

Composition of milk. The composition of milk is at the present time engaging the attention of expert chemists; such investigations may at first view seem of little use to the stockman, yet when he finds himself with young animals which must be raised by hand, a knowledge of the various milks will render him capable of securing gains from those animals; which otherwise might take years of experimenting to find out. For example, a foal has to be raised by hand; on consulting the tables below, mare's milk is found to be richer in sugar and poorer in fat than cow's milk, as a consequence he will, if obliged to, use cows milk, add sugar and possibly dilute with water before giving it to the foal; if bent on pushing lambs for the show-ring, the stockman will use the best cow's milk he can get, ewe's milk being so much richer in fat than that from cows. One ewe's milk at the Wisconsin Station tested fourteen per cent. butter fat. Milk tends to diminish in quantity and improve in richness (per cent. of butter fat) as lactation progresses.

COMPOSITION OF MILKS.—(HENRY.)

	Water	Casein and Albumen	Fat	Sugar	Ash
Mare	90.78	1.99	1.21	5.67	.35
Cow	87.17	3.55	3.69	4.88	.71
Ewe	89.82	6.52	6.86	4.96	.89
Sow	85.4	6.04	8.24	4.75	1.07

Fleming, in his Obstetrics, places the animals in the order of the richness of their milks, as follows: bitch, ewe, goat, sow, cow, camel, Woman, ass, mare. The first milk after the birth of the young is richer and thicker than ordinary milk, containing a large per cent. of albumen and ash, less water, and is termed Colostrum. This colostrum is usually secreted during the first four or five days after calving. It is intended by Nature to remove the fecal matter (meconium) accumulated in the bowels of the young animal before birth. This natural purgative has done its work when the feces (dung) of the young animal changes from a black or dark brown to a yellowish color.

Some breeders when preparing for a milk test get their cows up to a rather fat condition previous to calving, then when the test begins a short time after coming in, the fat on the animal gradually disappears, to reappear in the milk pail, this method, however, is only available for a short test.

In the show-ring various expedients are resorted to in order to mystify or deceive the judge. For example, one-quarter of an udder may be deficient; the udder is balanced up by partially milking out the good quarters, leaving the poorly developed one untouched; in some

cases milk has been pumped into the udder after having once been withdrawn. Experts are not, however, deceived by such practices, the sufferer is usually the cow, and therefore indirectly the owner.

Owing to the fact that bacteria make their way into the teats, it is held to be good practice to milk on the ground the first few drawings of milk.

CHAPTER VII.

THE BLOOD AND LYMPH.

The discussion of the taking in of food left that food in a condition favorable for carriage by the blood, in fact, as soon as the food material has passed through the membranes (whether walls of blood vessels or walls of intestines) into the blood stream such food was said to be absorbed, or absorption had taken place. This absorption had, however, all taken place within a comparatively small area, therefore, unless this prepared food was distributed through the body it would be of comparatively little use. The selection and use of the food brought by the blood to various parts goes on in those parts, the waste has to be removed also or disease would result. In order for the blood to go to and return from the tissues, roads must be provided—arteries and veins—the motive power sending the blood to different points being supplied by a powerful muscle pump — the heart. **The lymphathic and absorbent system,** consisting of nodes and vessels, whose function is to collect not only the nutritive material by means of the lacteals of the intestines, but also to gather up the waste material, all of which they empty into the blood stream near the heart will be considered as part of the circulation, in fact, owing to the color of the fluid they carry, more or less milky in the lacteals and colorless in other parts, it has been dubbed the white blood system. **Blood** has two distinct

courses, which have been named according to the destination, the set of blood vessels going to and returning from the lungs constitute the pulmonary system, the other set having the office of distributing the blood to and collecting it from the rest of the body being termed the systemic circulation. Two branches of the latter are, the renal system, going to the kidneys, and the portal system, going to the liver. The material carried is a reddish liquid, known as the blood. If we draw some blood and let it stand for a time it is found to separate into a fluid serum and solid portion (clot). The serum is a pale yellowish fluid, and the solid portion a deep red. If the drawn blood is allowed to stand a still longer time, more fluid will be noted, while the clot has grown smaller. What causes clotting? The fibrin which is formed in the blood. This can be shown by whipping the blood with a bundle of twigs, which when withdrawn from the blood show stringy threads (fibrin), which are thus removed and clotting prevented. These fibrin threads imprison in their meshes the blood cells (corpuscles) and thus form the clot, consequently if the fibrin is removed no clotting takes place. Clotting (coagulation) is hastened by (*a*) moderate warmth, (*b*) rest, (*c*) contact with foreign matter, (*d*) free access of air; it is retarded by (*a*) cold, (*b*) contact with living tissues, (*c*) imperfect aeration, etc. Blood is alkaline in reaction, that from the arteries being red in color, that from the veins being purplish, relatively speaking, arterial (red) blood is pure, venous (purplish) blood impure. The blood cells are of two kinds, red (discs) and white (irregular in shape), the disc shaped ones being present

in the greater numbers, in about the proportion of 500 to 1, It is interesting to note that the white blood cells have the power of motion and thus pass through the walls of blood vessels, and also that if a white blood cell comes in contact with foreign particles, such as germs, coal dust, etc., it will flow around and enwrap the object, and thus the particle taken in may be carried from one place to another, knowledge of this fact aids us in reasoning out the spread of a disease from one organ or part of the body to another.

The white blood corpuscles have been termed the policemen or scavengers of the body, should germs gain entrance at any point through a wound there is a flocking of the white cells to the part and a battle royal between the germs and the white cells takes place, many on both sides are slain and are thrown off from the seat of war (the wound) as pus (matter); if, however, the body attacked is in good health its white cells win, overcome, kill and cast out the slaughtered; if, however, the germs are in the majority, the white cells weak, further inroads are made by the germs, the disease affects one organ after another until the animal or person dies from the disease. Tissue that has run its course, and is worn out and requires removing, since its place has been taken by younger structures comes under the influence of these cells, which originate in the marrow of bone, and is removed.

Red blood cells are about $\frac{1}{3200}$ of an inch in diameter and contain in their substance the hemaglobin or red coloring matter of the blood, might be considered as bags of jelly like protoplasm saturated with hemaglobin.

This red coloring matter combines very readily with the oxygen of the air. The paleness often noticed in weak animals, whether weak from lack of good food, pure air, or as a result of loss of blood, is due to a deficiency in number of the red cells, and therefore of the red coloring matter, the coloring matter may be dissolved out, thus accounting for the peculiar coloration of meat that has been frozen and then thawed. The difference in the contents of the red blood cells before and after birth are made use of in the human race for the detection of crime. These cells contain a nucleus before birth, after they do not, so that in case of the finding of a dead child, if no nuclei are found in its red blood cells it is assumed that it has lived a day or two, if nuclei are found the child was still born.

White blood cells have an average diameter of $\frac{1}{2500}$ of an inch.

The amount of blood in the body varies with the animal, it has been estimated in the horse to be about equal to $\frac{1}{9}$ of the body weight, in man about $\frac{1}{15}$.

The blood pump (heart) is a hollow muscle, cone shaped, and in the horse about 5½ lbs. in weight. It is situated in the chest cavity between the right and left lungs, its apex being downwards. It is divided into two well marked halves, each of which is again divided into an upper chamber or auricle and a lower chamber or ventricle, consequently we speak of the right side of the heart and the right auricle, or ventricle, as the case may be. The division between the auricles and ventricles is not as perfect, being only by valves, as is the division between the right and left heart. These valves serve

another purpose, that of preventing a backward movement of the blood, in order to do so efficiently, little cords of great strength are attached to the valves and thus prevent them being pressed back out of place, such provision is needed when one thinks of the enormous pumping power of this organ. Each chamber of the heart has certain openings to it and from it, all guarded by valves, for example, in the right ventricle are two openings, one from the right auricle, the other into the pulmonary artery. The course of the blood through the heart is as follows:

Starting in the right auricle it flows to the right ventricle, thence to the lungs by the pulmonary artery, where it will be remembered oxygen (O) is exchanged for carbonic acid (CO), it is then returned, purified, by the pulmonary vein to the heart, this time being poured into the left auricle, from which it passes to the left ventricle and thence by means of the aorta to all parts of the body. From the various parts of the body the blood is brought back by small veins which unite to form larger ones until it is again emptied by the vena cava into that part of the heart known as the right auricle, the point from which the start was made, thus the blood has made the entire circuit. Harvey was the first man to thoroughly understand and describe the circulation of the blood.

Arteries and veins form the channels for the circulation of blood, the arteries taking the blood from the heart, the veins fetching it towards the heart. These tubes or channels are made up of three coats, differences in which aid us in determining whether we are looking at an artery or vein. The inner coat of an artery is com-

posed of endothelium and some elastic tissue, the middle coat is made up of muscular and elastic fibres; the outer coat, very strong, is formed of connective tissue and elastic fibres, it is far less easily torn than the other coats and is more resistant to pressure. Arteries as a rule are deeply seated in muscles to avoid injury, communicate freely with one another (anastomosis) and are always accompanied by a vein. The inner and middle coats of veins differ somewhat from those of arteries in the tissues present, and thus is accounted for the collapsed state of the end of a vein when seen in meat, the end of an artery remaining open. Many veins have valves, especially those of the limbs. When traced to their small branches, arteries and veins are seen to be continued into a network of small blood vessels or capillaries, therefore for all practical purposes arteries may be said to end and veins to start in these capillaries.

The pulmonary artery springs from the right ventricle and terminates in the lung by means of small capillaries which are spread over the air cells.

The main trunk of the arterial system (aorta) starts from the left side of the heart and then divides into an anterior, supplying the front of the body, and posterior, supplying the remainder of the body. The front (anterior) aorta divides into branches one to each fore limb, and is continued up the neck, where it again divides into the carotids, and by subdivisions supplies all parts of the head and neck. The arteries given off to the fore limbs (brachials), again divide and are continued as the humerals and later as the radials, it will be noticed that the arteries of the limbs take their names from the bone

they are close to, the radials give off the metacarpals at the fetlock, which divide into branches and thus supply the forefeet with blood.

The posterior aorta is directed backwards and upwards and runs along underneath the backbone until it reaches the loins, where it divides into two trunks, one to each hind limb. Before reaching the loins it has given off a number of branches to supply the stomach, intestines, liver, kidneys and the reproductive organs. Each trunk is known as an iliac, these being continued as femorals, then as tibials and later as metatarsals, small branches being given off quite frequently. The latter (metatarsals) are peculiar inasmuch as they are found on the outer sides of the hind cannons, and are sometimes cut, on plow shares, wire fencing, etc. It has been stated that as a rule arteries are deep seated to be out of the way of injury. The metatarsals at the hind fetlock divide up and from them blood is supplied to the hind feet in a similar manner to that supplied to the fore feet by the continuations (branchings) of the metacarpals.

The Veins. The main difference between arteries and veins are in their construction and work. Veins are usually in twos, deep and superficial, the former with an artery. In the veins of the limbs are found valves which prevent the passage backwards of the blood. It is often a question when blood is coming from a wound as to whether that blood is from a vein or from an artery, if from an artery the blood comes in spurts (jerks), when from a vein, it flows. The vein carrying blood from the lungs (pulmonary vein) is an exception to the rest inasmuch as it carries purified blood. Most veins start in

the capillaries, the portal vein, however, fetches blood from the stomach and intestines to the liver. The arteries, it was mentioned, kept dividing and subdividing until the capillaries were reached, the veins do just the opposite in that they keep uniting until a large vein (vena cava) is formed, which empties into the right side of the heart. The jugular vein in the furrow of the neck is the one from which blood is usually drawn in cattle and horses.

The Lymphatic System. This system consists of vessels and nodes (glands), the latter term nodes being substituted for glands, owing to the fact that these nodes do not secrete, hence it would be wrong to term them glands. The system might be compared to a line of railway with the nodes as the stopping places. The nodes are bean shaped and can be readily found in the animal after death, e. g., between the lungs, on the inside of the limbs, thighs and in the folds of the mesentery, when if cut in halves the outer part is seen to be lighter in color than the inner, they resemble a very small kidney in fact: from these nodes are sent out leucocytes (white blood cells); *the spleen or milt* may be considered as a modified lymphatic node. The vessels originate as very small channels in the spaces between the cells of the body, especially those of the serous membranes. Lymphatic vessels are found in all parts of the body, those in the limbs possess valves; these vessels unite and gradually form larger vessels, until the thoracic duct is formed, which runs along underneath the back bone and empties into the vena cava. The lymphatic nodes are markedly affected in many diseases, such as tuberculosis, etc.

CHAPTER VIII.

THE NERVOUS SYSTEM.

Fortunately for the stockman and the veterinarian, farm stock do not suffer from "nerves", such attacks occurring at inconvenient times, although the domesticated animals are very easily frightened and certain animals are sometimes irritable, it is as a rule in the latter case especially, modified or cured by plenty of work. The organs going to make up this system and their functions, therefore, will only receive a brief consideration. **The brain, spinal cord** and **the nerve fibres** make up the **nervous system,** which has the faculty of receiving and interpreting impressions, more or less under the control of the animal: it also has the regulating of the vital functions, such as *milk secretion, bowel movements,* the *heart's action,* etc., which are not under the direct control of the animal. In order to render the study of the nervous system easier we divide it into (a) **cerebro-spinal** and (b) **sympathetic systems.** The first division (a), which is made up of the brain, composed of four parts, the spinal cord, the nerves originating from the brain, and the chain originating from the spinal cord. The nerves of the first division have been termed nerves of animal life as distinguished from those of the second division (b), termed nerves of organic life. Nerve tissue is made up of white and grey matter. Nerves consist of bundles of fine fibres enclosed in a sheath; along the

course of some nerves are enlargements termed ganglia. The nerve ends take the form of loops or bulbs according to their locality, e. g., as loops in muscles, as bulbs in mucous membranes. A nerve fibre retains its individuality its entire length, if a nerve is cut across the ends do not unite or grow together; the part away from its source of nutrition dies.

A. The Brain. The large portion of the brain is known as the *cerebrum;* this portion is the seat of intellect. The faculties of reason and memory are derived from the cerebrum. This part of the brain is located underneath the forehead. From the base of the brain originate the twelve pairs of cranial nerves, some of which go to supply sensation to the ear, eye, tongue, nose, etc. The *cerebellum* is an organ with the power of co-ordinating muscular movement, that is to say, it controls the muscular part, moves them in the right direction and at the right time. For example, the crossing of the limbs when walking by the intoxicated person shows lack of co-ordination.

The *Pons* connects the various other parts of the brain, some of the fibres going to make up the cranial nerves originate here. The *Medulla oblongata* may be considered as a prolongation of the spinal cord, it forms a pathway of nervous impulses to and from the brain, gives origin to some of the cranial nerves, and contains the center or headquarters to which the nerves governing the heart, lungs, circulation and part of the digestive tract bring messages and receive orders, thus the nerve centers controlling mastication, swallowing, sucking, vomiting, breathing, coughing, secreting saliva, and the

diabetic centers are located in this division of the brain. Injury to the medulla generally results in instantaneous death, breathing being at once stopped.

The spinal cord is located in the spinal canal, a hollow, bony cavity running through the vertebrae; this canal is of far greater size than the cord, thus allowing room for extreme movements, such as bending the head around to the side. The spinal cord might be considered as an immense telegraph cable, made up of a number of small cables or wires, each carrying its own message. Some of the fibres (tracts) cross at the upper part of the cord, and for this reason an injury on one side of the brain will show paralysis on the opposite side of the body. The cord is also of interest because it contains the following nerve centers: the *ano-spinal*, in the region of the loins, controls the passage of feces; the *vesico-spinal*, in the same locality, governs the passage of urine; the centers governing the sexual organs are also located in the region of the loins; centers controlling the blood vessels (vaso-motor centers) and nutrition of tissues (trophic centers) are found throughout the cord. An unfortunate result of nerving horses sometimes is seen in the sloughing of the entire foot; such illustrates the control of the nutrition of a part by nerves as well as the property of sensation given by them to a part. Injury to the upper part of the spine shows in paralysis of the lower part of the body, and the continual passage of urine and feces, or else complete stoppage of these functions. In addition to the above functions, the spinal cord gives off pairs of spinal nerves, at such points it is enlarged corresponding to the number given off, which leave by two

roots, one motor (the lower) the other sensitive (upper), they unite and later on are combined as a mixed nerve, distributing their upper fibres to the spinal muscles and skin, the lower to the sides and lower parts of the trunk and limbs; fibres also being sent to join the other (b-or sympathetic) system. The nerves of the limbs are derived from large plexuses in the armpit and groin, and are generally deep seated, accompanying the arteries in their course.

B. The sympathetic system is found underneath the spinal column as two chains, with enlargements along their course, as has been stated; they are the basis of nerve supply to the organs of nutrition, such as the lungs, liver, heart, intestines, blood vessels, etc. Surrounding the brain and spinal cord are three membranes (dura mater, arachnoid and pia mater), between them a fluid is found, the purpose of these is to protect such sensitive and important structures as the brain and cord from concussion and injury. The proportionate size of the brain and spinal cord varies in different animals according to the place they occupy in the scale of intelligence; thus the greater the weight of the brain the lighter the spinal cord, *e. g.*, in Man the brain weighs fifty ounces, the cord one and one-half ounces; in the horse the brain weighs twenty-three ounces, the cord ten and one-half ounces; the proportions respectively being 33 to 1 and 2.2 to 1. The convolutions of the cerebrum are separated by depressions (sulci), the deeper these are the higher the intelligence. Captain Hayes rates the intelligence of animals in the following descending scale: Man, dog, cat, ass, pig, horse, ox. The nervous system of animals

therefore may be considered as simple when compared with that of man, consequently the known list of nervous troubles in farm stock is comparatively small. Roaring in horses is probably the most frequently observed in the list, latterly stringhalt, milk fever, tetanus have been removed from the list of pure nervous diseases.

THE SPECIAL SENSES.

The organs of the special senses are the eye, ear, nose, and tongue; there remains for description, which must necessarily be brief, the two former.

The eye is the organ of vision, and owing to the ease with which it may be destroyed or affected, becomes at once an object of importance to the stockman, especially so when engaged in the raising and marketing of horses. It is protected by the eyelids, eyelashes, and the haw (membrana nictitans) or winking eyelid and the tear apparatus. The eye may be compared to a ball having a watch glass (cornea) fitted in at the front, its work being similar to that of the lens of a camera.

The ball (eye) consists of three layers, outer (sclerotic and cornea), middle (choroid and iris), inner (retina), enclosed in these layers are substances termed humors, which have various functions. The fluid in the front part of the eye is termed the *aqueous humor* and is for the purpose of giving shape to that part of the eye, it is quite watery and is being constantly secreted during life; as a result of operations some of it may be drained away, but is replaced by more fluid later on; behind this fluid is the *crystalline lens* made up of layers resembling an onion, the eye is focussed by movements of the lens.

The *vitreous humor*, a jelly like mass fills up the bulk of the eye, and is located back of the lens, once destroyed is never reproduced. The inner coat, *retina*, is the distribution of the optic nerve (nerve of sight) and is consequently the most important structure in the eye.

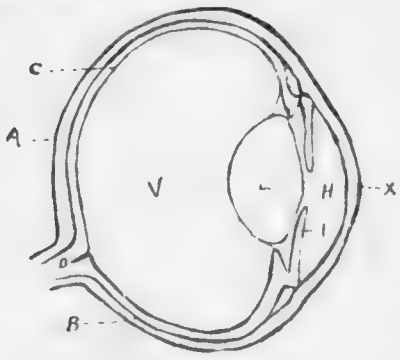


DIAGRAM OF A HORSE'S EYE.

A—Sclerotic coat. X—Cornea. B—Choroid coat. I—Iris. C—Retina. D Optic nerve. V—Vitreous humor. L—Crystalline lens. H—Aqueous humor.

The choroid coat lines the sclerotic, at its front portion is attached a muscular curtain, the iris, located in front of the crystalline lens. This curtain (iris) is pierced in its center by an opening, which varies in shape in the different animals and is known as the pupil. This opening is dilated or contracted, by two sets of muscular fibres, according to the amount of light the sensitive structures of the eye are able to take in. The color of the eyes is due to the iris, in most horses it is of a brownish yellow tint, in others white or grey, when the latter color, the horse is said to be wall eyed: at the upper border of the pupil of the horse little black sooty looking dots are seen, these are the corpora nigra, they are said to absorb rays of light.

The outer covering, *sclerotic coat*, is hard and fibrous, and receives the attachment of the muscles of the eyeball, it is opaque; at its front portion is inserted the cornea (watchglass), a delicate transparent membrane made up of layers of cells; between these layers as a result of

inflammation material may be deposited, such is often thought by people ignorant of the construction of the cornea to be a scum; it is important to remember that this is not the case and that therefore the use of strong irritants such as powdered alum or powdered glass is not only cruel but wrong and never beneficial. The eyelids are two movable curtains having in their free edges hairs (eyelashes) and glands. The eyelashes are to prevent the entrance of particles of dirt, the gland's secretion retains the tears, in sick animals the secretion of these glands is seen at the inner corner of the eyes as a sticky matter.

The haw, or membrana nictitans is placed at the inner corner of the eye, it is somewhat gristly in its nature and has the important function of removing dirt from the eye. Its development depends on the use of other members of the body to remove dirt, etc., *e. g.*, in cattle it is quite large, whereas in man and monkeys it is very small, the latter being able to remove foreign matter by their hands; its functions being known, none but ignorant persons will remove it unless diseased. In lockjaw (tetanus) it may be seen to be rapidly passed over the eye, if the head is raised or the animal excited, in such cases it aids in the detection of this serious trouble.

The tear machinery consists of (1) a gland which secretes the tears, situated at the upper part of the eye, (2) a little round reddish brown body in the inner corner of the eye, which directs the tears to (3) the ducts, which carry those tears to the nasal cavity (q. v.). Tears in animals are for the purpose of moistening the eye ball and to wash off small particles of dirt, it is

doubtful if they are at all the result of the emotions as in the human, properly speaking "tears" are an accumulation of the secretion of the lachrymal glands, and as such, although the term has been applied to the secretion, cannot be said to exist normally in the animal. The conjunctiva may be considered as a continuation of the skin, joining the eyelids and eyeball, it is very vascular, containing a large number of fine blood vessels, this characteristic is made use of in the detection of disease.

Above and behind the eye is a pad of fat, filling up the hollow space there, in old animals the fat partially disappears. *The eyes should be clear and free from tears, the pupils black, the eyelids thin and free from wrinkles.* Small eyes in horses are termed "pig eyes" and are considered a sign of inferior breeding. Horses showing much white in their eyes are often suspected of viciousness, if the ears are laid back and the teeth shown such a suspicion is likely warranted. The eyes should be placed wide apart, thus giving the wide forehead, considered by many as one indication of a pleasant, reasonable disposition.

The ears or organs of hearing are rather complex internally, the outer portion, consisting of cartilage (gristle) covered with skin, being all that is of much interest to the stockman. The erect, alert ear is desired as being an indication of health and vigor, although in horses, the lopped ears are not always indicative of ill health or the tired feeling; in sheep, however, the ears droop considerably during sickness. The ears should be fine, thin and lean so that they are semi-transparent, all evidences of breeding. Horses suffering from blindness have quick moving, restless ears.

The external ear is gristly and contains sebaceous glands, the secretion of which gives the color to the inside of the ear, bright yellow being desired by the dairyman. In the external ear is the entrance to the middle ear containing the ear drum and small bones, internal still is the nerve of hearing located in the inner ear. Horses sometimes become deaf when shot over during hunting expeditions, the deafness in some cases being temporary, in others permanent.

The Skin. Along with the skin such structures as hair, horn and glands (sebaceous and sweat) are found, the glands have already been described.

The skin covers the body and by so doing aids in regulating the temperature of that body, it also is the organ of touch.

Examination of this covering shows it to consist of two layers, one on the surface, the epidermis, containing nerves and pigment granules, the latter gives color to the skin, and the dermis, which contains nerves and blood vessels; like all other tissues, these divisions of the skin are made up of cells, arranged in layers, the upper ones of which are being gradually changed to meet outside conditions and are eventually shed.

Among stockmen the condition of the skin is considered an indication not only of health, but of breeding and ability to use the food furnished to the best advantage. In horses the glossy coat with fine hair is so much desired, in beef cattle the following essentials are called for, often included under the special term—*handling*—such are a soft, silky coat of thick, furry hair (in winter), a pliable skin of good thickness, with a mellow cushion

underneath. In the dairy cow that same pliability of the skin, which must be somewhat thinner than in the beef type, is desired. In sheep the color affords the best indication, a pink color being much approved of by shepherds.

Hair grows from the hair follicles, which are a folding in of the epidermis to form deep narrow depressions; these depressions are well supplied with nutriment, and are lined with cells from which are developed hairs. Hairs are placed obliquely (on the slant), and by means of a little muscle placed close to their roots, are brought into the upright position, the effects of which are seen in boars and dogs when excited, other conditions, such as ill-health, cold, etc., have the same effect. Each hair is enlarged at the enclosed end, and is lodged in a hair follicle. The whiskers or cat hairs seen on the lips of horses and cats are furnished with nerves which render these hairs very sensitive. The term horse hair refers to the hair of the mane, forelock, tail and fetlocks, and in some breeds, notably Shires, to the strong coarse hair at the knee and hock. In the pig the term "bristles" denote hair; in sheep, where it is very fine, long and wavy, it is known as wool; in the mule and ass, the forelock and mane are either lacking or else only partially developed, the hair of the tail in these animals being limited in quantity; in cattle, the development of hair at the end of the tail is known as "the switch." The *escutcheon* of cows, held by some to be an indication of a cow's milking qualities, is formed by the two-way-direction of the hair on the back part of the thighs; from the udder, the hair being directed upwards, on the outside

of the thighs it takes the opposite directions: the opposite directions of the hair on the backs of pigs constitute swirls. The color of the hair varies in animals at different periods of their lives, e. g., the iron gray horse as it ages grows whiter; the color is also affected by wounds, old scars often growing white or gray hairs; the foal is generally an entirely different color to what it is at maturity.

The hair is a valuable aid to determine the quality of an animal; coarse hair means a coarse skin; waviness in the hair of the tail, a sign of want of breeding. The long hair on the legs of heavy horses is dubbed "the feather," and the term silky denotes the quality desired. The claim of more endurance for some colored horses than for others is stoutly upheld by many horsemen—it is more probable that the conformation, and not the color, was at fault. Capt. Hayes says that dark-colored horses endure the heat better than light-colored ones. Favorite colors in horses are determined by Fashion, and that controls the market to some extent, especially with regard to coachers, saddlers, roadsters, etc. Every one, possibly, has heard it said "that a good horse cannot be a bad color," and also that if a horse has one white foot buy him, two try him, etc., be that as it may, great splashings of white are not desired on the body, unless for the circus. Coal black horses fetch high prices for funeral purposes. The location of the white markings on horses have been named, thus rendering description of those animals more easy, e. g., a small patch of white in the center of the forehead is called a star, if the patch is larger it is dubbed a blaze, a narrow strip right down

the face is called a ratch, and if the white spreads over the face the term bald is often applied; "snip" refers to a little patch of white on either lip; "white stocking" and "white sock" refer to markings on the limbs, the former up to the knee or hock, the latter to the fetlocks. Gray horses are very liable to what is named Melanosis black tumors, we may term them, and although removal is sometimes performed, unless they interfere with the health of the animal they should be let alone.

The hair grows according to the climate, season, food, etc., and is shed at certain seasons of the year; in poultry the condition is known as "moulting," the feathers in fowl representing the hairs in animals. The character and quality of the hair varies with the breeding, e. g., in Galloway and Angus cattle. Showmen of horses, cattle and sheep, blanket their charges to improve the condition of the skin and hair; poultrymen confine their birds to the shady places to avoid "brassiness of the plumage" due to the sun's rays. The hair preserves the skin from wet, cold and the direct action of the sun's rays. Intimately related to the hair are those structures known as the horns of cattle and sheep, the chestnuts of horses and asses, and the coverings of the foot, termed hoofs in the horse, ass and mule, and claws in sheep, swine, cattle, etc.

The horns vary in size and shape according to the breed and sex, they grow from the matrix at their base; they are more or less hollowed out, the frontal sinuses being continued into them.

The Chestnuts. These bare, horny structures are said by some people to represent an evolutionary stage

through which the horse has gone, they are found on the inside of the forearm and on the upper part of the inner face of the hind cannons.

The Ergots in horses are found growing from the skin of the fetlock and correspond to the hard soles of animals that walk on their soles (Man, dog, cat). In cattle they are undeveloped digits. Chestnuts and ergots are better developed in the underbred horse than in the well-bred animal.

CHAPTER IX.

THE FOOT—ITS CARE AND SHOEING.

The Hoof and its Contents. The importance of this organ in animals cannot be overestimated, in the horse especially are good feet needed; without good feet his value is lessened according to the degree his work is interfered with. While cattle, sheep and swine are not used for draught purposes, yet they also should have good feet, in order to render their getting to the feed trough and market sure, and in those used for breeding, to render them capable of performing that valuable function. The foot consisting of the hoof and its contents will therefore be described, that of the horse being taken as the type. Approaching the foot from the outside the hoof is first reached, seemingly a continuation of the skin, which it is.

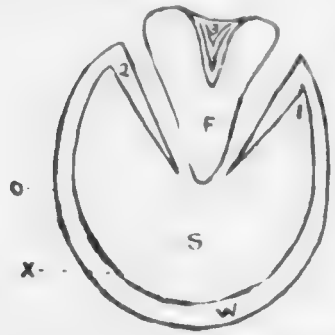


DIAGRAM OF THE UNDER SURFACE OF THE FOOT.

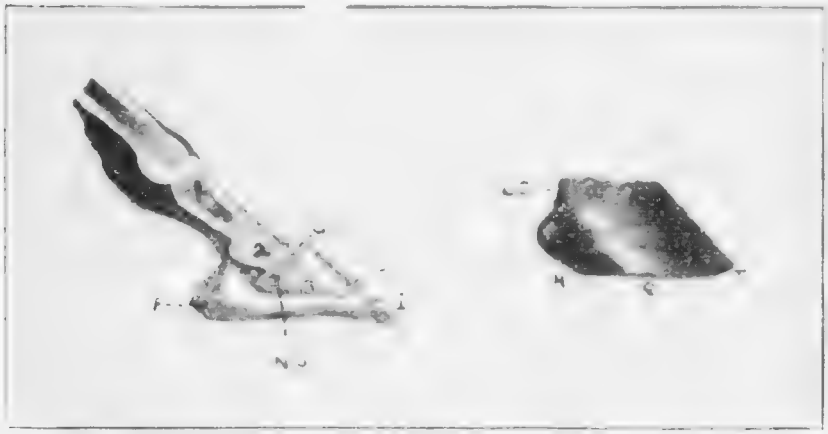
W, wall. S, sole. F, frog. 1, Sulci of corns. 2, the bars. 3, cleft of the frog. O, outside of wall.

The hoof is divided into *the wall*, *sole* and *frog*, the wall being that part seen when the foot is on the ground. **The wall** is also divided into parts, viz., the toe, quarters, heels, bars, surfaces and borders. The toe forms the front of the hoof and is the deepest and thickest part of the wall, passing back it grows shorter at the quarters, that part midway between toe and heel, passing back still further the

heel is reached, at which point the wall makes a sharp turn inwards and forwards until it meets near the point of the frog, the continuation of the wall from the opposite heel; the wall thus forms an acute angle at the heels and it is at this point where corns are usually found; these inturned portions of the wall are called "the bars" and act as braces to the foot, consequently they should not be cut any lower than is absolutely necessary. The outer surface of the wall is rounded and covered by its protector, *the hoof varnish or periople*, which should not be removed by the rasp, such removal exposes the horn to the softening, drying and destroying influences of the weather, the horn of the wall is not meant to be soft, it has to bear weight, on the other hand it is not improved by a drying out process of which brittleness is the result; it is, however, interesting to note that the feet of horses grown in dry countries are more durable than those of horses raised in wet countries (Points of the Horse, Hayes). The growth of horn is similar to that of plants, excessive moisture being bad for both. The internal surface of the hoof presents from five to six hundred little parallel plates known as the horny or insensitive laminæ. The leaves (laminæ) are separated from one another by deep grooves into which fit the corresponding sensitive leaves (laminæ). In a groove at the upper part of the wall lies the coronary cushion (band), from it is developed the wall. The inferior border of the wall is that part to which the shoe is attached and when unshod is in contact with the ground. The slope of the wall should be that given by an angle of 50° and should conform somewhat to the slope of the pastern; the outer

surface of the wall should be smooth naturally, and straight from the coronet to the ground.

In the show ring the artifices of the groom often come into play for those horses having a poor or broken wall, in such cases the broken space is filled with wax or the entire foot is coated with gutta percha, ends of nails being inserted in the material to further aid in the deception, consequently it is well in all cases to examine thoroughly excessive smoothness of the horn in old horses being always open to suspicion.



The sole is a thick plate of horn on the under surface of the foot, filling the space between the bars and lower edge of the wall. Its upper surface is convex and receives the sensitive structure above, its lower one is concave, depending of course on the animal. The tendency of

the sole to flatten increases with work and age; an excessively wide spread heel will tend to let down the sole. The sole should be strong, concave on its under side and of fair thickness, the sole tissue flakes off during wear. Bruises of the sole usually show by discoloration; the sole is not intended to bear any great amount of weight; in its union with the wall it forms what is termed *the white line*, the back (posterior) border of the sole is V shaped and runs into the angle formed by the bars and wall. **The frog** is a mass of spongy horn lodged between the bars designed to receive a considerable portion of the weight of the body and by its elasticity to diminish concussion, on its under surface is a small depression known as the cleft; its upper surface presents small openings to receive the sensitive parts above, in its center is an elevation corresponding to the cleft, known as the frogstay. Inside of the sensitive structure are the bones of the foot; these bones may be said to represent the human foot, the sensitive structures the stocking, and the hoof the boot.

The lateral cartilages, two half-moon shaped pieces of gristle found at the upper part of the quarters, are of interest because so often affected, being turned into bone (ossified) and thus rendered immovable; the cartilages are attached below to the wings of the pedal bones.

The sensitive laminæ may be considered as growths or continuations of the coronary cushion and it is important to remember that the band (coronary cushion) on account of its manner of growth should on no account be cut through or the shape and appearance of the foot will be injured; if by any means the wall is stripped so as to

leave the laminæ bare, those leaves seem to grow rapidly; it has been said that these laminæ are sensitive; such being the case, the severe pain shown when a horse is foundered (laminitis) is thus accounted for. **The hoof** is developed from the skin, the horny material coming from the superficial layer of the skin, the sensitive structures from the deep layer, such being the case it is readily understood how the hoof and skin are alike in color. The hoof is made up of fibres resembling hairs, stuck together, with a downward and forward direction. It seems to be the accepted opinion that white hoofs are more delicate, porous and prone to disease than are dark colored ones. The growth of the hoof downwards and forwards is uniform in the healthy foot, the rate of growth is about a third of an inch a month: hind hoofs grow faster than front ones, and unshod faster than shod. The conditions favoring growths are—exercise, moisture and barefootedness; the time required for the hoof to grow from the coronet to the ground at the toe is 12 months, at the quarters 6 to 8 months, and at the heels 3 to 5 months.

Hoof ointments do not affect the horn already secreted, but may stimulate the growth of horn from the coronet. When weight is put on the foot there is a widening out at the quarters, top and bottom, the height thus being lessened, and the sole becomes flatter; weight is then thrown on the lower bones, which sink down and back, the corona (short pastern bone) presses down the fatty cushion, which in turn pushes out the lateral cartilages, and if movable, these cartilages push out the wall at the quarters: the pressure brought to bear upon the frog due

to the earth's resistance, presses it and the bars outwards. The result of all these movements are: 1, to protect the body from shocks; 2, to aid and increase the spring (elasticity) of the limb, thus giving an easy, untiring gait, besides limiting concussion; 3, to increase the circulation of the foot, and thus insure a proper growth of horn. No portion of the body will retain its usefulness unless used; Nature is firm in her laws and does not supply nourishment in the form of blood to parts not in use, consequently if a good frog is desired, it must not, by shoeing or other means, be relieved from receiving pressure.

The claws of cattle and sheep really consist of two halves of feet, the division in the bones starting at the fetlock. The space between the hoof is termed the cleft, and at its upper surface in sheep a gland is situated which may get blocked with dirt, etc., and thus cause soreness in the feet. All animals need their feet attended to at regular intervals, neglect results in deformity and disease, especially so is this the case in colts kept in box stalls and in cattle and sheep. An examination will often show the horn grown long and curled in under the heels, sometimes large pieces are broken out of the wall. In the stable abundance of clean, dry bedding should be used. No animal should have to stand in wet or muddy places for any considerable length of time or such diseases as foot rot, thrush and canker will result.

A good hoof should be straight in the wall, no hollows or unevenness, no cracks or fissures when felt with the palm of the hand, it should be smooth; a rough, harsh feeling and a dry appearance indicate brittleness. The

bulbs of the heel should be rounded and strong, the sole concave (hollow) and not separated from the wall at the white line. The frog should be strong, well developed with its cleft broad, dry and shallow, no unpleasant smell should be present. The bars should have a forward and inward direction to the point of the frog, there should be no stains in the sole at the heels, while the lateral cartilages should be elastic to the finger touch, the periople should not have been rasped away. In cattle and sheep the wall should be trimmed to about the level of the sole, and the points of the toes rounded off.

Shoeing. On account of the artificial condition that animals, particularly horses, are subjected to, special treatment of the feet had to be provided, such treatment, a necessary evil though it is, evil because it interferes more or less with the natural action of the foot, is termed shoeing.

Horseshoeing is an art dating from the Gauls before the Christian era. William the Conqueror is said to have introduced shoeing into England. Napoleon's disastrous retreat from Moscow was made worse from lack of horse shoeing, and as modern warfare employs horses for cavalry and artillery purposes to a greater extent than formerly, horseshoeing becomes a necessity. In the more important and more peaceful walks of life, such as agriculture, etc., horseshoeing is just as important, as the getting of the products to markets, etc., depends to a large extent on the preparedness of the horse; in field work, such as plowing, harrowing and other farm operations, shoes are better dispensed with if possible, the feet will, however, still require regular attention.

The special objects of shoeing are:

1. To protect the foot from excessive wear; 2, to enable the feet to get sure footing on ice or slippery roads; 3, to overcome as near as possible faulty conformation, balancing the foot and limb as it might be termed; and, 4, to cure or improve diseased conditions of the foot. The feet of colts should rarely be shod, in fact refrain from shoeing as long as possible. When horses are shod the shoes should be removed every four to six weeks, the excess of horn rasped away and the shoes refitted; it is important to remember that the excess of horn, the result of growth, be removed. In the past people cut off too much, nowadays many have gone almost to the other extreme. If horses are to go barefooted more horn should be left, the sharp outer edge of the wall should be rounded with the rasp to avoid splitting of the wall, loose flakes of the sole or frog being cut off. The wear of a shoe is due to friction between it and the ground, the wear may be natural (normal) as in a sound young horse; or unnatural (abnormal) in an unsound horse, e. g., wear of the toe in navicular disease and spavin, wear of the heel in laminitis (founder). On the upper surface of the shoe marks of wear are seen due to the play of the quarters, at this point can often be noted the slope, whether intentional or not, of the heels of a shoe, such a slope, if inwards assisting to close the heels, or if outwards to open them, such a bearing and direction should not be given, the shoe surface should be perfectly level.

Examination of a foot. When about to examine the foot or remove a shoe always see that the animal can stand comfortably on three legs, then by passing the

hand down the limb to be lifted, pinch slightly with the thumb and first finger just above the fetlock, the foot will usually be lifted by the animal, to hold it easily, grasp the toe of the foot and thus let the animal bear its own weight: in removal of the shoe a firmer grip is necessary. All clinches should be lifted before trying to pull off the iron, and when doing so avoid twisting of the foot, or injury to the joints at that part will result. The greater number of shoeing smiths are more competent to judge of the amount of trimming and cutting required by a hoof than is the average horse owner; the trouble is usually that people do not take their horses to the smith *often enough*. The frog should be left prominent, so that it will project beyond the bearing surface of the quarters and thus limit the amount of jar. As the bars are inflections of the walls, and therefore meant to support weight, they should not be cut away. The pattern of the shoe for the sound foot is immaterial so long as its bearing is true and level and rests on the walls and bars. The shoe surface should be wide enough to cover the wall and white line, the web being wider at the toe than at the heels. Toe and heel calks are better dispensed with unless on slippery roads. Avoid excess of weight in shoes; for that purpose steel and aluminum are used. Horses are made to go high by leaving on lots of foot or by weighting with heavy shoes, the weight being placed at or near the toe, therefore, the extreme high action shown by some horses may be considered as more or less artificial; education has a great deal to do with high action, as it is well known by horsemen that the so-called high stepping breeds need educating in order to get the highest action out of them.

Hoofs of working horses should be picked out and cleaned daily. The ground surface of shoes should be flat, or rolled slightly at the toe.

In order to examine the hind foot, if the animal is at all unreliable, stand with the back to the horse's head; if the near hind foot is to be examined, stand on that side and run the left hand gently, but firmly, down the limb, beginning on the top of the rump, until the hamstring is reached, just above the point of the hock, grasp that part firmly, then with the open right hand, palm up, grasp the leg just at the pastern, lift and place on the thigh. Various defects of the gait, such as forging and interfering, contracted feet are rectified or improved by shoeing.

Forging is a defect of the gait, due mainly to conformation, being higher at croup than at withers, long legs and short bodies, or legs too much underneath the body. It may be due to weakness, laziness, bad shoeing, or the delight of hearing the clicking sound. The noise (clicking) is made by one hind foot or shoe striking the front shoe of the same side.

To correct the trouble give the feet their proper slope, about fifty degrees, by lowering either the heels or toes. The front shoes must be no longer and no wider than the hoof; the hind shoes should be shortened at the toe, the lower edge rounded, no toe clip, and the shoe fitted so that three-fourths of the thickness of the wall at the toe will extend beyond the shoe; in some cases the use of heavier shoes in front, say fourteen ounces in front, six to eight ounces behind, is advisable; always drive the horse well in hand, so that he goes up on the bit, the gait cannot be collected unless the driver handles the reins properly. A shoe angular at the toe instead of

round is well thought of as a means of correcting this trouble. If a front shoe is struck by a hind foot of the opposite side that is known as cross-firing.

Interfering may be applied to brushing and speedy cutting, the former is the wounding of the fetlock by the inner quarter of a shoe or foot of the opposite leg; speedy cutting is the wounding of the leg near the knee or hock by its fellow on the opposite side. Horses that turn their toes out are liable to interfere; knock-kneed horses will also speedy cut. It is a very dangerous vice in saddlers, bad enough in drivers. This disease needs the expert shoer who will have to study his patient, drive behind him and probably shoe a few times before entirely curing him. If unshod, horses rarely brush. The wall of the outside quarter of the foot struck may be lowered, and the striking edge of the shoe eased off with a file. A shoe heavier on its outside web than on its inside half will often relieve the condition. The use of some form of boot is recommended, wounds made will need general antiseptic treatment, Friar's balsam is very useful. Young horses often grow out of this trouble, as soon as wearied the colt should be unhitched. Thomas Cowhey, before the Master Shoers' Association, says: "Interfering is due to lack of strength in the hind parts, leg weariness and too heavy shoes. The remedy—use as light a shoe as possible, and if all else fails use strings of interfering rubber beads as low on the fetlock as possible, which must be removed as soon as the drive is over."

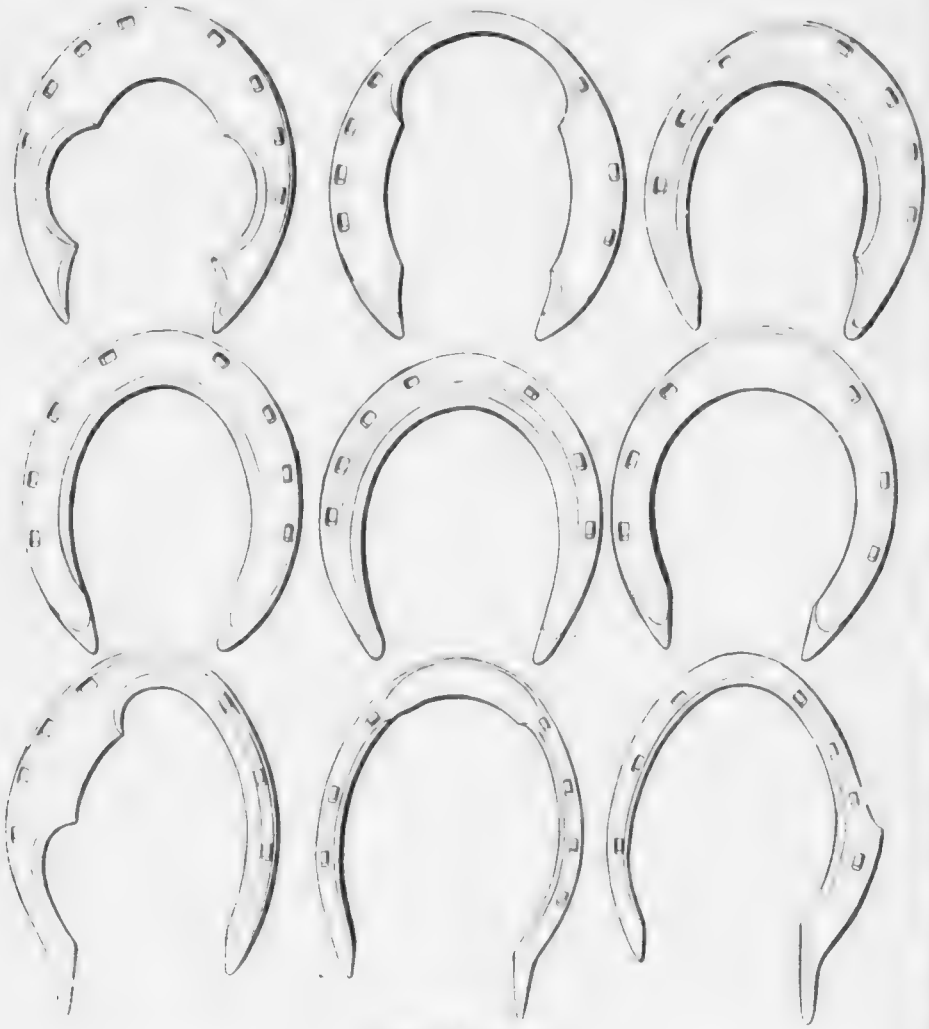
Corns are usually due to improper shoeing, excessive growth of the heels, or the pressure of a stone on the sole which has been too much thinned, or a loose shoe; cutting away of the bars lets the wall curl in on the seat of corns,

or the smith may rasp down the bars and wall and not remove the piece of the sole in the angle thus formed, thus bringing pressure on a part not meant to bear pressure. To correct, use a bar shoe after the usual treatment, or let the animal go bare footed.

Laminitis (**founder**), the use of the rolled heel and toe shoe, the bar shoe or some of the patent pads to be found in the market will often render a lame horse work fine; if the sole drops use a wide webbed shoe, and a leather sole packed with tar and oakum.

Contracted feet are usually the result of poor shoeing, either by raising the heels too high and taking away the natural frog pressure, or by the use of shoes with an inward slope of the upper surface of the shoe heel; the causes indicate the cure, barefootedness is as good as any.

Horses difficult to shoe may have the fore foot of the same side tied up, and by means of hobble and rope draw back the hind foot. Sometimes the disinclination to stand is due to the animal being thrown out of balance by the smith drawing the hind leg out too far from the body, therefore always see that the horse is able to stand, which may be aided by turning the head to the side opposite to the foot to be lifted. The rope twitch can also be used, the foot being kept raised by tying it to the tail. If a kicker tie up a front foot first, then a hobble to the hind foot to be lifted, take a rope (one-half inch) 20 feet long, fasten to the tail, then run the two free ends through the ring of the hobble, one from each side, the ends are now held by two men, standing at right angles to the horse, one on each side of the limb, as they pull the leg is lifted, the fore leg should be let down before attempting to lift the hind one.



TYPES OF SHOES.

Shoe with weight in the toe; extends the stride.

A heel weight rolling motion toe shoe; shortens the stride and gives more knee action.

A side weight shoe for a knee bumper.

A plain plate.

A rolling toeI shoe, intended to quicken the stride of a dweller.

Scoop toe shoe, the scoop taking the place of the calk.

A side weight shoe, causing a horse to go wider behind.

A scoop toe hind shoe, breaks over more rapidly than if calked.

Shoe with heel side-weight, useful where the ankle rolls out, strengthening it and giving it wider action.

CHAPTER X.

HOLDING A POST-MORTEM.

The stockman or his veterinarian will sometimes have animals die upon their hands, and as it is not always desirable to incur extra expense, the stockman will be the one to examine the dead animal, or hold a post-mortem, as it is termed.

To be of any value a post-mortem should be held within a few hours after death, as destructive changes soon take place in dead animals; if properly conducted and careful note made of the conditions found, a post-mortem may be of considerable value to science and a source of satisfaction to the owner.

The necessary instruments are a good butcher knife and a saw; along with these there should be a few quarts of good antiseptic in solution, so that the person holding the post-mortem can cleanse his hands and arms frequently, the latter precaution should on no account be neglected, especially in cases where the cause of death is unknown. The animal may be examined in one of two positions, (1) *when lying on the back*, or (2) *on the side*, if the former it will need to be propped up, the front legs being allowed to drop to each side by cutting the muscles in the armpits. An incision is then made with the knife, right along the middle line of the belly, care being taken to avoid cutting any of the bowels; that done the knife is made to cut from the flank nearly to

the back bone and the flaps laid back, the bowels will then be in view. The saw can then be used to saw between the hind legs, thus letting them fall to the ground besides opening up the pelvis, the saw can also be used on the ribs, cutting them midway between the breast bone and back; by lifting the sawed piece out the lung cavity is exposed and its contents in view. Always cut through the skin and muscles before using the saw on a part.

If the animal is on its side, preferably its right side, the abdomen should be opened and the ribs sawed close to the back and breast bones, the sections removed, thus exposing the entire lung and bowel cavities; when removing the part over the upper lung it should be noticed whether the inner surface of the part removed had adhered to (grown to) the lung.

If the disease affecting the animal was known, only those parts affected need be examined; it is, however, better to examine the entire body.

Draw out the big gut (great colon) and unfold it, then the small intestines as far as possible, thus exposing the mesentery, its blood vessels and nodes, which should be examined; then the remaining intestines are drawn out over the back. After a careful examination of all the parts they are cut through at their attachments and removed.

In cattle and sheep the stomach should be removed and examined first, the third stomach and contents in cattle and the fourth in sheep being scrutinized thoroughly. When the stomach of a horse is opened the quantity of bots present should be mentioned in the notes

kept; the digestive tube should be examined for ruptures, enlargements of the blood vessels, redness or blackness signs of inflammation), stoppages, and worms, the latter may be in the bowel walls (e. g., sheep).

The spleen, which is attached to the stomach, should be examined; it should be somewhat elastic, retaining the imprint of a finger, and be of violet blue color, approaching to red; it usually weighs about two pounds.

The pancreas may be overlooked unless one is careful; it is somewhat triangular in shape, weighing about one pound; it is of a reddish cream color.

The kidneys weight 27 and 25 ounces, the right being the heavier, are reddish brown in color, those of cattle are lobulated. The liver in horses weighs about 11 pounds, and is of a solid brown color, and is very friable, being easily crushed by the fingers. If the venous circulation has been impeded in the heart and lungs, the center of each lobule will be red, the margins yellow or green in color, this is the usual appearance after death. If there has been active liver congestion the liver will appear mottled; if, however, there has been active inflammation of the liver it will be red in color. No gall bladder will be found in the horse. The head and neck should be examined, looking at the thyroid glands, the teeth and nostrils.

The sexual and urinary organs should be looked over for stone in the bladder, etc., pus in the kidneys or uterus (womb).

The lungs and heart should now be carefully examined, note the condition of the pericardium (the outside covering of the heart), and then the heart itself. Pointed

objects are sometimes found in the hearts of cattle. The lungs are next in order, their coverings being very carefully looked over for adhesions; several cuts lengthwise should be made in the lungs to detect medicines, matter (pus) or hardened spots (consolidation). The lymph nodes found in the mesentery, between the lungs at the splitting of the windpipe, those at the back and side of the pharnyx, in the armpits and groin, the submaxillary and other salivary glands, should all be examined, the lymph nodes being cut into, if enlarged, and a cheesy, gritty material found, tuberculosis should be suspected. The stockman rarely has time to examine the limbs and brain, the former, however, in cases of disputed lameness should be examined, especially the hocks, lateral cartilages, splint bones, coffin and fetlock joints, for spavin, side bones, sprains and ringbones, respectively. Note should be made of all the lesions found.

CHAPTER XI.

SIMPLE FARM MEDICINES.

The up-to-date stockman will have his chest of medicines for his stock, not with the idea of treating anything or everything, but for the purpose of meeting unexpected conditions and for the treatment of simple diseases. Before any person can use or prescribe medicines intelligently it is essential that they understand the actions and doses of those medicines; not only is it essential that the stockman know something about medicines, and that something well, he must also know the best methods of giving such medicines. The kernel of the matter is that the stockman must be an **animal nurse** to render efficient service when his stock are sick. Medicines are often classified according to their actions, each class being given a distinctive name. The utility of such a classification is at once seen, e. g., an animal is sick, the owner instead of being told to use a specific drug such as iron, is advised to use a tonic. Running over the list of drugs in his farm medicine chest he remembers that he has a drug there with a tonic action, and uses it, whereas had he not understood the term — tonic — the animal would have had to go untreated.

Seven classes of drugs will be considered and examples of each given, the first five are generally given internally, the last two being intended for external use only.

1. Stimulants. Under this class are found medicines which have the power to excite or increase the vital activity of an organ, they stimulate in fact. Their action is prompt but only temporary or transient, their effects soon pass off.

Alcohol in the shape of whiskey, brandy, rum, etc.; ammonia; sweet spirits of nitre; turpentine; coffee, are all examples of this class, their use would be justified after some exhausting work, such as a hard drive, in fact in such cases their use will often head off an attack of lung trouble.

2. Tonics. The tonic family is a large one, and one that is the most useful of all to the stockman, because in this class are included the great natural medicines;—good food, pure air and water, proper grooming and exercise. Although other tonics are mentioned, it must not be forgotten that their use will only be profitable when combined with the above mentioned tonics. Useful drugs of this kind are—iron in one of its forms; gentian root; quinine; bluestone (copper sulphate); nux vomica; aloes, etc. Tonics are somewhat slow in their action but are permanent in their results, they improve the appetite and blood circulation and therefore tone up the entire system. The following, or Douglas mixture, is a splendid tonic for fowls: Sulfuric acid $\frac{1}{2}$ ounce, copperas 6 ounces, rainwater 4 ounces; give a tablespoonful to 6 quarts of the drinking-water; for colds it is very good.

3. Purgatives. This class of drugs are especially useful to the stockman because by their aid he is often enabled to rectify mistakes in feeding or treatment. Pur-

gatives act upon the bowels and auxiliary organs, and in that action purge the entire system of injurious material. They cause increased action of the bowels by stimulating the bowel movement (peristalsis), cause an outpouring of fluid from the bowel walls, or they may hinder the absorption of fluids, as a consequence the feces (dung) is more watery than usual, or if a stoppage has occurred, it is overcome. The milder purgatives are often termed laxatives, of which the following are commonly used: bran mashes, green food, sulphur, molasses, small doses of raw linseed oil, epsom or glauber salts. The purgatives in general use for farm stock are aloes; salts (sulfate of magnesia) and raw linseed oil.

4. Anodynes comprise the pain relieving class, relax spasm, and quiet nervous excitement; such are warmth in the form of poultices and fomentations, cold applied by means of ice or very cold water, sweet spirits of nitre, laudanum, aconite. This class of drugs requires more care in the use of its members than probably any of the others previously mentioned.

5. Anthelmintics are a very useful class, as by their use the stockman is enabled to rid his flocks and herds of internal parasites, generally termed worms. Anthelmintics may be said to kill and expel worms, examples are iron sulfate (copperas), copper sulfate (bluestone), common salt, pumpkin seeds, gasoline, benzine, kerosene (coal oil), creolin, santonine, turpentine and aloes.

6. Vesicants. The members of this family of drugs are suited for external use only, as they are very irritant and will raise blisters, hence their name, from the Latin, vesica, a blister; spanish fly (cantharides), binio-

dide of mercury, ammonia water, turpentine, hot water, strong acids or alkalies, belong to this class, in some cases they even destroy tissues.

7. Antiseptics. This class of drugs has revolutionized both human and veterinary surgery and there is probably no one class of medicines that will pay the stockman as handsome a profit in their use as will the antiseptics. Contagious diseases and wounds become less formidable to handle if antiseptics are used plentifully, consequently the stockman should never let his supply of these useful drugs be exhausted. Fortunately the class is a large one and a selection can be made quite easily. It must be remembered that many of them are poisonous, hence must not be left where children or animals can get at them: there are, however, some of them that may be used internally, such, however, should be used under the veterinarian's directions. Boracic acid, creolin, carbolic acid, corrosive sublimate (bi-chloride of mercury), permanganate of potash, tar, bluestone are antiseptics in common use, and the list is constantly being added to: besides these the various proprietary articles to be found on the market, such as chloro-naphtholeum, germol, zenoleum, possess antiseptic properties to a greater or less degree. Antiseptics act by destroying germs, thereby preventing or arresting putrefaction. Some members of this family may be used for killing such parasites as lice, ticks, maggots found on the bodies of farm animals.

The actions of other drugs have also served to group them, e. g., medicines acting on the kidneys, thereby increasing the urine are termed Diuretics: those that lower the temperature of the body, as in fevers, etc.,

are termed Febrifuges; those overcoming acidity are termed antacids; aphrodisiacs, medicines increasing sexual desires; emmenagogues, medicines said to bring on oestrum or heat (?) are also illustrations of the method of classification used.

THE FARM STOCK MEDICINE CHEST.

The chest may be made of wood, fitted up according to the articles it will contain. A good box, three feet long, two feet wide and two feet deep, with a lid well hinged on and possessing a good lock, will suffice. This box can be fitted up with shelves and a couple of drawers, for convenience it may be fastened on a wall and thus take shape as a cupboard. The following dose table and rules should be typewritten or printed and pasted up on the inside of the chest door:

You can give a	A full dose at	A half dose at	A quarter dose at	One-eighth dose at	One-sixteenth dose
Horse..	3 years and up	1½ to 3 years	9 to 18 months	5 to 9 months	at birth up
Cow ...	2 years and up	1 to 2 years	6 to 12 months	3 to 6 months	at birth up
Sheep..	1½ years and up	9 to 18 months	5 to 9 months	3 to 5 months	at birth up
Pig.....	15 mos. and up	8 to 15 months	6 to 8 months	3 to 6 months	at birth up

N. B.—*a.* Keep all bottles tightly corked.
b. All bottles must be labeled, especially those containing poisons.
c. Always read the label on the bottle before using any of its contents.
d. Be sparing with drugs.
e. Do not feed condition powders, instead use the natural tonics, good food, air, water, exercise, all to be given regularly.

The Chest should contain the following drugs and instruments: Creolin or some good substitute, 1 lb.; sulfate of magnesia, in a tin, 5 lbs., raw linseed oil, ½ gallon; powdered ginger, 1 lb.; ammonia water, 8 ounces; sweet spirits of nitre, 8 ounces; powdered sulfate of iron, 4 ounces; laudanum, 8 ounces; turpentine, 1 lb.; pine tar, 2 lb. can; 2 ounces of blister, biniodide of mercury; 1 physic ball (8 dram aloes). One or two good metal milk tubes, a 2-ounce measuring graduate, glass; one cattle trocar and canula, a 1 quart pewter syringe, one 1-ounce hard rubber syringe and a glass funnel. The entire lot can be secured at a moderate cost. It is not advisable to keep large quantities of drugs on hand, as they spoil rapidly. Powdered drugs may be conveniently kept in glass fruit jars. The household kitchen will be apt to afford sweet lard, mustard and baking soda if occasion should arise for their use. If a glass graduate is not available, the following table of equivalents will take the place:

One wineglassful is equal to one and one-half (1½) fluid ounces.

One tablespoonful is equal to one-half ounce.

One dessertspoonful is equal to two fluid drams.

One teaspoonful is equal to one fluid dram.

It might be convenient to remember that sixty drops minims are contained in one fluid dram (ʒ), and eight fluid drams in a fluid ounce (℥).

ACTIONS AND DOSES OF MEDICINES.

Acetic acid, a weak form of which is vinegar, is useful to apply to warts, and as an antidote to alkalies.

Aloes is the purgative in general use for the horse. The best variety is that known as Barbadoes aloes, liver brown in color, and when broken shows a shiny fracture. In small doses aloes is a tonic, in the fluid form it used to be applied to wounds, for a temporary dressing in cold climates, equal parts of tincture of aloes and tincture of myrrh is very useful. Aloes take 18 to 24 hours to act, or longer depending on the size of the dose, the feed of the animal, the breed of the animal and whether worked or not. It is a dangerous drug to repeat a dose of inside of forty-eight to sixty hours; whenever possible the horse should be prepared for the physic. It must *never* be used for mares when in foal, or for horses suffering from distemper or lung troubles.

The dose is four to ten drams either in a ball or solution. This drug can best be obtained in the ball form from one's veterinarian. When preparing horses to go into winter quarters, or just previous to fitting for spring work, aloes have a beneficial effect.

Bluestone (copper sulfate) is a good astringent and is often used in cases of foot-rot in sheep and cattle; in thrush in horses, or to apply to proud-flesh (excessive granulations). Internally it is used as a tonic or anthelmintic in doses of thirty to sixty grains for mature horses and cattle; when used externally the strength varies from full strength down to a solution containing five grains to the ounce of water.

Creolin is a product obtained from coal tar, and is a good antiseptic. It mixes well with water, making a milky white solution, is used externally with from ten to fifteen parts of water.

Copperas (sulfate of iron) is a tonic in small repeated doses, in large doses it constipates and lessens the appetite: is largely used in bloodless (anemic) conditions, and is frequently used as a worm medicine: next to linseed meal it is the largest constituent of condition powders. The dose is from one half to one dram in the food given twice daily. It should be kept in a well-stoppered bottle, as the air tends to spoil it. It is a useful antiseptic for disinfecting stables, used at the rate of one pound to a gallon of water.

Epsom Salts (sulfate of magnesia) is the common purgative for cattle and sheep. Given just before calving to heavy milkers it is a useful preventive of milk fever (parturient paresis): it should be combined with common salt and ginger, one-fourth of each to one of the epsom salts.

The dose for cows is one to two pounds; sheep, four to six ounces. It should be dissolved in one or two quarts of warm water and given as a drench. Salts are also useful as a laxative for feverish conditions in horses, being used in one to three ounce doses for this purpose.

Ammonia water (liquor ammonia) is used in liniments and liquid blisters. The ammonia liniment consists of equal parts of ammonia, turpentine and raw linseed oil, it may be made less severe by using more oil and less of the other drugs. It is a useful drug in bloating of sheep and cattle, in such cases always being well diluted with milk, raw linseed oil or cold gruel.

The dose is one to six drams.

Lime water is a useful drug, especially in the indigestion of young animals, due to overrichness of the dam's

milk. In colts showing a need of bone forming material it is a useful adjunct to the feed. It is quite easily prepared. by taking a piece of lime (fresh) and putting it into a gallon of water, let stand for a few days, keeping the bottle well corked. The clear solution is used in doses of one to four ounces two or three times daily.

Equal parts of lime water and raw linseed oil make a simple soothing application for burns in all animals.

Linseed oil (raw) is a very valuable laxative for pregnant mares. It is mild in action if given in moderate doses and can be repeated without danger. An occasional dose of this drug will ward off attacks of azoturia and stocking of the limbs.

The dose for horses is one-half to one and one-half pints; cattle, one to two pints; sheep and pigs, six to twelve ounces.

Linseed (flax seed) tea is a valuable nutrient in sickness and is used with separator skim milk for calves.

Linseed meal, the residue after the extraction of the oil, forms the bulk of condition powders, which is therefore the costliest way of buying this food.

Laudanum (tincture of opium) is obtained from the poppy seed gum and is largely used as an anodyne. It is constipating in its effects, so is useful in scouring calves or lambs. It is also used by shepherds at lambing time for ewes with after pains; in colic cases it is combined with sweet spirits of nitre and water. In moderation is a stimulant to the brain and spinal cord.

Horses and cattle take from one to three ounces; sheep and pigs, two to six drams. If combined with warm oil it is useful for inflamed udders and sprains.

Sweet spirits of nitre is a stimulant and diuretic, and also lowers the temperature in fevered conditions. Is much used in colics, colds, or whenever a stimulant is needed.

One to three ounces for horses, one to four ounces for cattle; sheep and pigs take two to four drams, diluted in four to six times the amount of cold water.

Turpentine is one of the most useful medicines in the whole list. It is used as a diuretic and stimulant and to ward off swelled conditions (purpura hemorrhagica) following influenza.

For colic or bloating in cattle it is unsurpassed, and is also a reliable anthelmintic; applied locally it is a severe irritant and should never be applied full strength to wounds; mixed with raw linseed oil four to six parts, it is a useful application for rheumatism in cattle and pigs.

One to two ounces are given internally to horses; cattle take one to four ounces; sheep, two to four drams; it must be given well diluted with water, oil or milk.

Sulphur burned on charcoal in a tightly closed up building is a valuable disinfectant. When mixed with oil or cream, in the proportion of one to four, it is a good dressing for the skin of hairy-legged horses; some grooms mix it with kerosene (coal oil) in preference to raw linseed oil, such is to be recommended if there is any gumminess in the limbs. It is very seldom used internally, although a mild and safe laxative for pregnant animals; it may be given to cows and mares in doses of one to three ounces, sheep take a half ounce at a dose.

Tar is antiseptic in its properties and is especially useful in foot troubles, especially those of cattle and sheep.

It has been recommended as a preventive of grub in the head of sheep, the drug being smeared on the nose. When given internally horses and cattle take half to two ounces smeared on the tongue.

Kerosene is used as an anthelmintic in horses, in doses of two to eight ounces, given in twice the quantity of milk; if mixed with water in the proportion of one to ten, it is a serviceable remedy for itchy tail in horses.

Ginger is a useful stomach stimulant, and prevents griping, for which reason it is added to purgatives.

Dose for horses is one-half to one ounce; for cows one to four ounces; sheep one to four drams.

Carbolic Acid is used externally, one to fifty parts of water; it is the common antiseptic.

Quinine and **Whiskey** are largely used as bracers for sheep when at shows, and are very useful if these charges of the shepherd are a bit off feed.

Corrosive Sublimate (perchloride of mercury) is a deadly poison, albeit, a reliable antiseptic, added to water, one to one or two thousand parts of water. It is best procured in the form of tablets, the same as used for preserving milk samples for the composite test. Another form of mercury is the red iodide, used for blisters, for which purpose it is mixed with from six to eight parts of sweet lard or vaseline.

Poultices are much used in diseases of the feet or for painful wounds. The material used may be bran, turnips, linseed meal or spent hops, the nurse will have to adapt whatever may be at his disposal in order to apply them, old gunny sacks or salt bags are sometimes used. It is essential that all poultices be kept moist, and in the

majority of cases hot. In warm weather they must not be allowed to sour or remain on too long or the wound will be made worse rather than better, due to the increased germ population. In such cases an ounce of creolin added to the poultice will be useful. A clean sweet poultice is made with folds of cheese cloth soaked in a hot carbolic acid or corrosive sublimate solution.

Poisons and their Antidotes. Drugs administered in too large or too frequent doses become poisons, a few of the common ones are given with the symptoms caused and the antidote.

Aconite, that old friend of the stockman is a very common cause of death among live stock, due to over doses.

Symptoms. Attempts at vomiting, retching and gurgling sounds in the throat, difficult breathing, depression well marked, froths at the mouth, sweating.

Antidote. Give stimulants, whiskey, coffee or brandy, keep warm, blanket and hand rub.

Arsenic is sometimes used to improve the condition of horses, a dangerous method in the hands of novices. The symptoms are colicky pains, depression, pulse small, rapid and irregular, breathing hurried, and sometimes diarrhoea; if slow poisoning is taking place, the eyelids are puffy, eyes watery and irritable; shortness of breath when worked, and depression.

Antidote. Stop giving the drug, and give fresh sesquioxide of iron or magnesia half-pound doses in warm water; give stimulants.

Ammonia Water in large undiluted doses causes great pain, slavering and casting off of the mucous lining of the mouth, difficulty in breathing, cough, choking effects, the poison may be smelled from the breath.

Give vinegar, one-half pint in a quart of water or lemon juice, unless the animal cannot swallow; then let it inhale (breathe in) acetic acid or strong vinegar fumes.

Corrosive Sublimate causes great pain, purging with bloody mucous feces and difficult breathing, the skin cold and moist. Give as antidotes plenty of whites of egg, milk or flour gruel and stimulants.

Carbolic Acid causes the mouth lining to be white and hard, urine dark, shallow, difficult breathing, weakness, seems stupid, pulse weak and irregular, pupils contracted. Use as antidotes epsom or glauber salts in large quantities, whites of eggs, oil and stimulants.

Strychnine in poisonous doses causes continued spasms, the animal being all twisted up, breathing is stopped as a result. Give large doses of spirits or two to three ounces of chloral hydrate in water, or let them inhale chloroform.

Water Hemlock or wild parsnip causes brain symptoms in cattle, spasms, convulsions, wild appearance, seems as if mad. Give a large dose of epsom salts.

CHAPTER XII.

MODE OF GIVING MEDICINE.

Animals are all more or less difficult to give medicine to, therefore the stockman must be careful to give it in such a way as to annoy the patient as little as possible and yet avoid wasting the medicine. Different methods have to be followed with the various farm animals, the stronger animals, such as horses and cows, require a certain amount of restraint in order to give the drugs successfully.

To get the effect of medicines they must be introduced into the body.

Medicines are taken into the system by three channels:

1. Through the digestive tract, in such cases being given by the mouth, in the form of powders, drenches or balls, and per rectum, by injection into the bowel.

2. Through the organs of respiration, causing the animal to breathe the drug, this is known as the inhalation method, and is useful in such diseases as strangles (colt distemper) or worms in the air passages (sheep and calves).

3. Through the skin, the medicines being absorbed. There are subdivisions of this, the absorptive method, the first one of which is employed by stockmen, the others being used by the veterinarian whenever necessary; they are: (*a*) epidermically, rubbing into the skin (epidermis), the general way of using blisters; (*b*) endermically,

the drug being applied under the skin, the rowel and seton are used in this method; (*c*) hypodermically, the placing of the drug or serum under the skin or into the tissues by the aid of the hypodermic syringe, at the present time the professional man uses this method in the giving of cocaine, morphine, etc., the testing of animals with tuberculin and mallein and when performing preventive inoculation for blackleg, and in the use of serums.

GIVING MEDICINES TO HORSES.

1. Powders, if not objectionable to the animal, may be given in the feed, when distasteful may be mixed with molasses and placed on the back of the tongue with a spoon or wooden paddle. The latter way is a nice method of giving drugs to horses suffering with sore throat, etc.

2. Drenching is the old way of giving fluids, and is a useful way when large quantities are to be given. Back the horse in a single stall and raise the head by means of a stable fork placed through the nose band of the headstall (halter), or better take a hame strap, buckle it, thus making a loop, slip into the mouth just back of the front upper teeth, then raise by means of a rope or fork until the teeth are a little above the horizontal. The medicine which is in a tin, hard rubber, or even a strong glass bottle or funnel, is poured in from the off side, the person drenching steadies the head with his left hand on the headstall, which should be slack enough to let the mouth open, and slowly pours in about a half cupful at a time. **If any attempts at coughing are made, at once let the head down.** Never seize the tongue or pinch the

nostrils when drenching. If the animal does not swallow readily tickle the roof of the mouth with one or two fingers. In some cases a person giving the drench may get on the horse's back, sitting well forward, draw the head round to the off side by the halter with the left hand and drench with the bottle in the right hand. The application of the rope or the noose twitch will often be sufficient.

A method sometimes used in drenching sick horses is to give the medicine when the patient is lying down. The operator must be agile, strong and watchful. A halter is placed on the animal, and as soon as he lies down the halter is grasped tightly on its underside so as to throw the nose of the horse in the air, the poll being held tight to the ground, the operator will be at the back of the horse and will place his knee on the patient's neck, and then pour the drench in slowly and at short intervals. If necessary the animal may be thrown and the head tied to a surcingle. Whenever it is desired to restrain a horse and keep him down by holding his head, the poll should be held to the ground, the nose up, the back of the head being drawn well back.

Fluids in smaller quantities may be given with a hard rubber (ounce) dose syringe, a very clean, nice method. The operator stands in front of the animal, with his left hand in the off inter-dental space opens the mouth and draws the tongue gently forward with his right hand, inserts the syringe at the near inter-dental space and discharges its contents on the back part of the tongue, the tongue being released as soon as the syringe contents are discharged.

If the stockman is expert at giving balls, fluids can be given in gelatin capsules.

In cattle the syringe can also be used, when large quantities are given, usually the case in ruminants, the bottle or horn is needed. If a horned animal, the assistant stands on the near side, seizes both horns and elevates the head, the drencher standing on the off side pours in the fluid in small quantities at frequent intervals; if dehorned, the use of a halter is an advantage, the assistant may also insert his fingers in the nose, or use the bulldogs (a form of pincers) and thus elevate the head. Another method which may be employed with a docile animal is for the drencher to stand on the off side, pass his left arm over the neck and with the left hand open the mouth and elevate it slightly, the bottle or horn is then inserted into the right side of the mouth, at a distance far enough to avoid trickling out at the corners and not too far so as to cause choking; the left arm of the operator brings pressure on the neck muscles and aids in lifting the head, which should be held a little above the horizontal. If the head is raised too high the medicine goes the wrong way. **Sheep** may be drenched by backing into a corner, getting astride of the animal, elevate the head slightly with the left hand, with the right hand pour in the fluid. For lambs and sheep difficult to drench the operator should sit the animal up on its rump, with its head between his knees, the medicine can be poured in with little risk of choking.

Precautions. **N. B.**—Cattle and sheep are easily choked when drenching, therefore it must be remembered that to avoid loss, only small quantities should be given to be

swallowed at one time, and if coughing occurs due to some of the medicine going the wrong way the head must at once be lowered, so that any fluid in the mouth may run out. I have known of many animals killed by neglect of these precautions. A special method of drenching cows down with milk fever is described under that disease. Avoid raising the head in any animal much above the horizontal. Do not pull the tongue forward, as such an action pulls the lid (epiglottis) of larynx up and thus opens the way to the lungs.

Pigs may be drenched by putting a noose over the upper part of the snout when the animal will hang back on its haunches and squeal, the medicine can be spooned in slowly. Pigs will take oil, salts and other medicines if given mixed with sweet milk in the trough.

Balling. Considerable dexterity is required to properly ball a horse, to do so the operator stands in front of his patient and with his left hand gently draws the tongue forward two to three inches, the right hand carrying the ball resting on the second and fourth fingers, the third finger on top of it, is carried back in a straight line to the root of the tongue, where the ball is left, the tongue at once released and the hand withdrawn. A few sips of water may be given and if properly done the ball will be seen to travel down the near side of the neck.

Inhalation Method. A pail of hot medicated (with creolin or turpentine) water is placed under the animal's head, a blanket or bag thrown over the head and neck and the patient forced to breathe the steam; sufficient air must also be allowed to come in or strangulation would result. In some cases, such as in large flocks of sheep

or calves, they may be confined in a tight building for a few minutes and sulfur burned there, the stockman should stay in with the patients.

Blistering. Through the skin, only the first method will be employed by the stockman, namely, the use of blisters and liniments. To apply a blister clip off or shave the hair over the part to be treated, then wash with warm water and soap, and dry. The nurse will then rub in the blister as long as it is absorbed, or according to the directions given by the veterinarian; the rubbing should take fifteen minutes after applying the blister, the hair below should be anointed with sweet lard or vaseline, to prevent blistering below the spot intended. Tie up the head for twenty-four to thirty-six hours, the first eight hours of the time he should be backed in the stall and tied crosswise, so as to avoid banging of his knees and to prevent him tearing the parts. At the end of thirty-six to forty-eight hours the blistered part should be shampooed with hot water and soft soap (not home made); dried thoroughly; clean, sweet lard then being applied every day, the parts being washed once every four days. At the end of ten days walking exercise may be given and a cooling lotion applied once daily. If four legs have to be blistered not more than two may be done at one time, an interval of a week being allowed before the other legs are blistered. A nerved limb or a horse in a weak condition should never be blistered. When rubbing in a blister or liniments, rub as far as is possible in the direction of the hairs.

The other methods, by means of setons and the use of the hypodermic syringe, belong to the province of the veterinarian.

PART II.

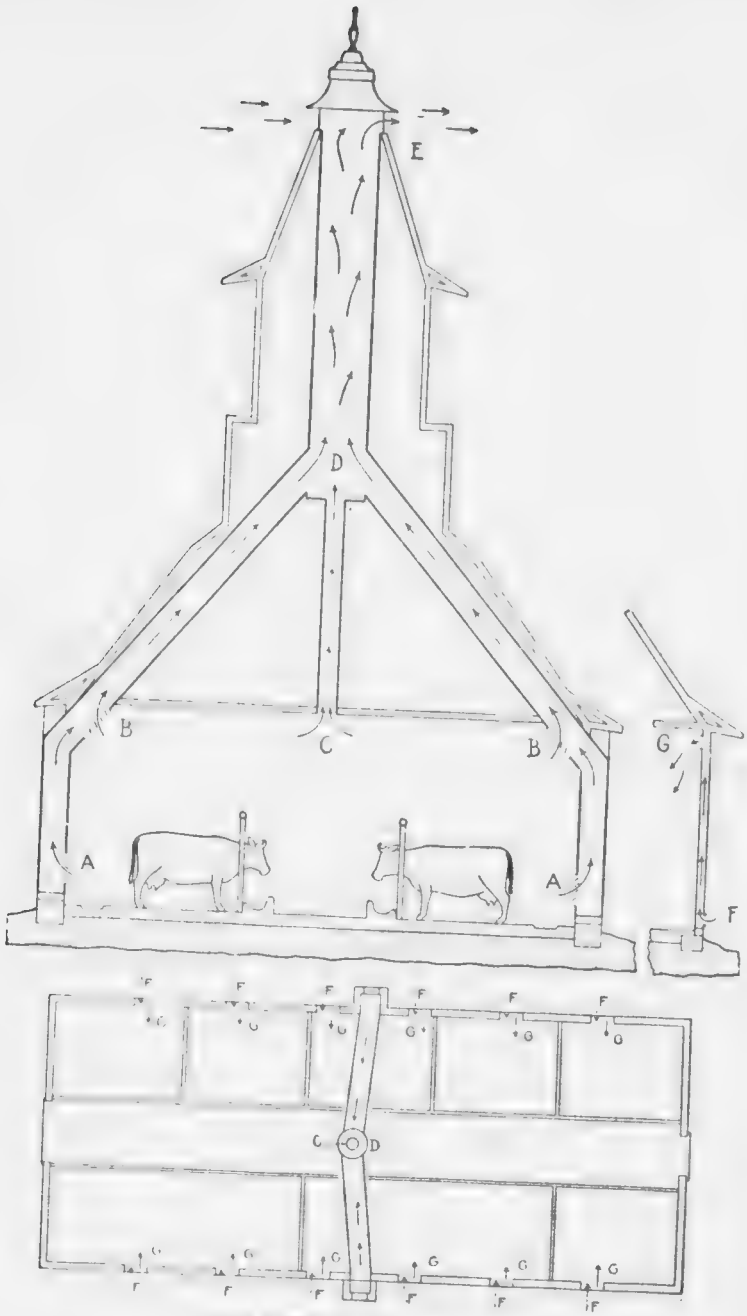
Diseases; their Prevention and Treatment.

CHAPTER VIII.

NURSING OF SICK ANIMALS.

The bulk of the work relating to the treatment of sick animals falls on the stockman, and accordingly as he attends to them, either good or bad, so will the results be good or bad. Nursing in some cases counts for as much as the treatment of the veterinarian; in any event, to get profitable results from the employment of the veterinary surgeon his instructions should be faithfully carried out and all possible assistance given. The average farm has not elaborate barns and stables, with electric light, hot and cold water, etc.; while these furnishings are helpful they are not essential to successful nursing. The stockman who is at all of a mechanical bent can fix up a suitable sick stall easily; there are certain essentials to be observed—plenty of pure air, meaning good ventilation, not drafts: lots of light, there are some cases needing a darkened stall; warmth, in the North not always easy to obtain, and plenty of room.

The sick stall is by preference a box stall, situated on the south side of a building, thus rendering it well lighted and cheerful; it should be twelve feet square and nine or ten feet high. The box should be clean and well bedded,



KING'S SYSTEM OF VENTILATION.

the walls as smooth as possible, so as to be easily disinfected; except in contagious diseases, the box should be so placed that the patient can see others of its own kind. The ventilation can be made right if a little attention be given to the matter. We have seen when discussing the physiology of the lungs how essential pure air is, and how that lack of pure air means lack of means of warmth to the animal. Prof. King (in the Fifteenth Report of the Wisconsin Experiment Station) describes a scientific method of ventilating a stable; this method is in use in the dairy barn and the horse barn and veterinary infirmary of the Experiment Station.

A single ventilating flue D E rises above the roof of the main barn and is divided below the roof into two arms A B D, which terminate near the level of the stable floor at A A. These openings are provided with ordinary registers with valves to be opened and closed when desired. Two other ventilators are placed at B B, to be used when the stable is too warm, but are provided with valves to be closed at other times. C is a direct 12-inch ventilator leading into the main shaft and opening from the ceiling, so as to admit a current of warm air to force the draft. The air enters the stable at various points F and G, and in the vertical section by arrows at F and G. Parke's system is very similar, as is shown in the ventilation of an ordinary room, by raising the lower sash of the window a few inches and closing up that open space below it by a piece of board, thus the current of air is not direct as it comes up between the two sashes. The stockman may sometimes have cases requiring a darkened stall, such as in lockjaw (Tetanus), the sick stall

should then be kept closed to visitors; in the majority of cases plenty of light is beneficial, one reason being that light is harmful to germs.

The floor may be of earth, well packed, plank or concrete, the latter of course is the easiest to cleanse thoroughly; in any case all stalls should be well bedded; in this connection it must be remembered that bedding soiled with the feces (dung) or saturated with the urine should not be allowed to accumulate in the stall. The large quantities of free ammonia in the stalls of geldings cannot but fail to have an injurious effect on their eyes, besides being wasteful of a valuable manure constituent. Gypsum sprinkled in the stall and stable will help overcome the difficulty after the soiled bedding is removed and before fresh, clean material is brought in. If the patient is very weak or lame cut straw will be preferable to the long article. In cases in which artificial warmth cannot be got, clothing must be used, such must be light, warm and fastened on securely; heavy clothing often does more harm than good. In this connection may be mentioned the absurd practice (especially in cold countries) of applying blankets wet with boiling water, unwrung, or bags of hot, wet bran; if heat has to be applied, have the blankets wrung out well and over them apply a waterproof sheet; hot, dry bran may also be used. Care must always be taken that the patient does not become chilled after the application of warmth.

The attention given the patient will include feeding, watering, giving medicine, taking pulse rate, temperatures and respirations, together with the use of enemas or the application of poultices, etc.

The pulse rate in the horse is taken at the lower jaw with the first two fingers of the hand gently pressing the artery against the bone, the person taking the pulse usually stands on the near side and takes it with the right hand. It may also be taken just below the eye, on the inside of the fore leg, under the tail and on the outside of a hind fetlock. In cattle it is taken at the side of the jaw opposite to the attendant or just above the fore fetlocks; in sheep it is taken on the inside of the thigh; in this animal, however, it is rarely of much value. The pulse beats will be found to number from 36 to 40 per minute in the horse, 45 to 60 in the cow. The **clinical thermometer** is of great value to the veterinarian and the nurse; no stockman should be without one, its use will often aid in determining whether an animal is sick or not, and if the owner of the animal consults with his veterinarian, that person if possessed of the correct temperature, pulse, rate of breathing, appearance of the feces and urine, together with the state of the mucous membrane, viz., of the eye and nose, will be able to judge as to the condition of the animal and prescribe accordingly. The temperature of animals is usually taken in the rectum, where the thermometer is allowed to remain from one to three minutes. *Always* shake the mercury down in the thermometer before using it, to do so place the instrument bulb down between the finger and thumb, then with a wrist move-

Clinical Thermometer

ment shake the thermometer in a downward direction. The healthy horse will have a temperature of 100° Fahr., the cow 100° to 104°, sheep 104°, young animals registering slightly higher. A daily variation of one degree (°) is quite common and natural, more than that is indicative of disease. The bulb of the thermometer should have a little vaseline put on it before introducing it into the rectum, it should be introduced slowly and if any obstruction is met with should be turned between the fingers and its direction slightly changed. If after the introduction feces are passed the temperature should again be taken after shaking down the mercury. Thermometers are fragile, so should be watched when in use.

The breathing if hurried can be noticed by the movements of the body, in some cases at the flanks and nostrils, if it is desired to count the respirations, the palm (which must be odorless) of one hand can be held in front of one nostril.

Sounds within the chest are only capable of interpretation by the expert. In the horse the breathing is naturally regular and has a rate of 12 to 14 respirations per minute, in cattle 15 per minute, the calf a little faster, 18 to 20 a minute. Sheep are easily excited and when so or exerted respirations are quite fast, when at rest they number 18 to 20. The breathing rates are reliable guides in horses, fairly so in cattle, but are of little value in sheep, towards the detection of disease. To examine the eye membranes (the conjunctiva) stand at the near side, place the left hand flat on the nose, and with the right thumb and forefinger examine the eye, by pressing

the eyeball into the socket; the nasal membrane is examined as follows: Hold the lower lip with one hand, with the finger and thumb of the other dilate the nostril. The attendant should note whether the muzzle is dry or moist, the skin hot, dry, tight or harsh, whether shivering or fevered, the patient will also be watched so as to note whether he changes his position often, getting up or lying down, pawing or retching (attempts at vomiting). The condition of the feces and urine whether the former are hard, dry, slimy or coated with mucus, whether worms are seen in the feces will also be noted and reported to the veterinarian, and while the work may seem onerous, attention to details is very essential in the nursing and treatment of veterinary patients.

The reluctance to eat, absence from the feed trough, hanging behind the flock or herd are all valuable indications to the careful stockman, even the eating of dirt or drinking of dirty water (when clean is supplied) should be looked into and the cause found.

Symptoms are generally more or less plentiful and only need cultivation of one's powers of observation to detect them, consequently we should expect that the person most frequently with animals in health should be the readiest to detect any symptoms of ill-health, reasoning still further, it is readily comprehended that the best veterinarians will, after a good college training, come from the ranks of the stockmen.

Watering, in healthy animals, should take place before feeding, slight quantities may be given after, this applies more particularly to horses, animals at liberty will drink as needed. The practice of refusing a drink to a warm

horse is cruel; while excessive quantities of very cold water are dangerous he should not be offered feed such as hay without a drink, two to four quarts of water will not hurt any horse, no matter how warm, letting a warm animal stand in a draft to cool off is where the danger lies. Ice cold water should never be given at any time, colics and abortions may result from its use. The amount of water may be limited if the animal is purging (scouring) or passing large quantities of urine (diabetic). While horses will rarely drink warmed water, if the chill is taken off it is better for cases of lung troubles; milking cows are given warm water by some dairymen in winter with good results.

Salt should be placed before animals at all times, in feverish conditions horses will often eat large quantities, and can be permitted to do so without danger to them. Salt is a condiment which promotes digestion and aids in tissue building.

Grooming should be of the toilet order, the eyes, nose and dock being sponged, the coat smoothed, the legs hand rubbed, especially if cold, when bandaging will be useful, the ears should be stripped and the clothes changed, beyond these the animal should not be worried.

If the patient is lying down continually, it should be well bedded and its position changed at least twice daily.

Exercise is rarely needed, especially in case of wounds or fractures, the box should afford all the exercise necessary, in convalescence from lung troubles a certain amount of exercise is beneficial, the lack of such exercise in lung cases being detrimental to the case. The patient must not be put to work unless quite recovered; it is a good

safe rule to never work a horse that misses a feed or two until the cause is found and removed. The animal that does not eat cannot reasonably be expected to work either in the traces or making flesh and milk.

Feeding Sick Animals. It must be borne in mind that food or drink should not be forced on sick stock, that what food is presented should be tempting, to be so it must be fresh, all traces of the last offering having been removed, in fact if an animal does not clean up its allowance within a reasonable time the materials should be removed so as to avoid tainting the feed box. The same rule applies to the drinking water.

Laxative food is indicated in sickness, with few exceptions, in fact those cases laid up on account of wounds need laxative food and a reduction in quantity. Variety counts for a great deal with the sick animal, for such purposes boiled food, bran mashes, grass, carrots, potatoes, small green wheat, oats, corn, etc., may be used in limited quantities. Milk and eggs are also of value, but will have to be given in a drench as a rule. **The bran mash** should be made as follows: Scald a pail, throw out the water, put in a gallon of bran and a tablespoonful of salt, add two to three pints of boiling water, depending on the consistency desired, mix well and cover up for 15 minutes, when it may be placed before the patient. A tablespoonful or two of powdered ginger added to a bran mash makes a nice feed for a tired or over driven horse, and should be given before oats are offered. Horses will rarely burn themselves, they do not care for sloppy mashes. To make linseed (flaxseed) tea take one pound of the seed and boil in four to six quarts of water until

the grains are soft. The linseed tea and bran may be combined with benefit. Hay tea – run good hay through the cutting box and half fill a pail with it, then fill up with boiling water, let stand until cold and give the clear fluid. Raw linseed oil is often given in the feed in quantities of from one-quarter to one-half pint daily, it is very valuable in Heaves, and puts a gloss on the hide, besides acting mildly on the bowels.

Backraking. The operation of unloading the hind bowel will in some cases have to be performed by the attendant, although the use of the injection pump has done away, to a large extent, with the necessity for the operation of backraking. The hands and arms should be well oiled and the nails pared before introduction.

Mustard is often applied to the sides in cases of lung troubles, although opinions as to the value of such applications differ, a mild application to the abdomen in bowel troubles, diarrhœa, etc., is often valuable.

Take a pound-tin of mustard, empty into a bowl, adding cold water, one and one-half tinfuls, mixing up well to form a paste, in some cases the hair should be clipped. Rub the paste in well with the hands; cover the mustard area with paper, and thus avoid soiling the blankets. Put on a blanket from below, and two above, which should be fastened with surcingles, etc., try and keep the animal on his feet for thirty minutes. In two hours the mustard may be washed off, only exposing one side at a time; if the stable is a cold one, leave the mustard on until the following day, when it should be removed with a brush and curry comb. The blistered surface should be dressed with oil, sweet lard, or vaseline after the removal of the blistering agent.

Bandaging in the stockman's patients is more frequently performed on the limbs than elsewhere, one reason being that the size and difficulty of retention on other parts of our patients renders a bandage useless. Bandages are used to hold parts together as in fractures (breaks) or wounds, to give pressure and support in sprains and filled or swelled legs, during training; to equalize the circulation (in chill, etc.,) and to hold dressings in place; for such purposes three kinds are used: 1. The stiffened bandage, made so by the application of starch or plaster of paris. 2. The flannel or cotton bandage. 3. The cotton batting bandage.

The stiff bandage is made from cotton torn in strips, which are thoroughly impregnated with the stiffening material, the strips should be about two inches wide and three feet long, splints of tin, one inch wide, may be used in addition—bound in with the bandage in fact.

The flannel bandage should be about eight feet long and four inches wide; red flannel is preferable. To be ready for use the bandage should be rolled with the tapes inside. The bandage is unrolled about eight inches and placed obliquely across the outside of the leg close to the knee, reaching about the center of the joint, the rolled part being turned outward, downward and forward, continuing down to the fetlock, and around it and brought back by winding close to the knee, the loose end is turned down, the folds of the bandage carried over it, the tapes being tied about the middle of the cannon bone. It is seldom of much use applying bandages around the hock or above the knee, the movements of the limbs will tend to displace them; for such purposes the truss

bandage is recommended. If a bandage is to be worn during exercise it should not go below the fetlock.

The cotton batting bandage is made and applied as follows: Take two yards of batting about ten inches wide, wrap the leg with it, over that apply a calico bandage loosely, then over that a similar bandage tightly. The entire bandage may be left on twenty-four to forty-eight hours; it is especially useful in sprains or filled legs, due to poor condition. The limbs should be hand-rubbed in all cases after the removal of bandages, and should be extended and flexed. Do not use dirty, caked or hard bandages; ordinary bandages should be removed morning and night, care being taken that they are not tied too tightly.

Washing the bodies of animals is not a general practice, mainly on account of the difficulty in drying them. Some horsemen sponge their charges with cold water after a hard day's work, thereby removing the sweat; its abuse must not be permitted.

The limbs rarely need washing unless in very muddy weather, or when affected with some skin trouble, the less often the better; when washing is done, good castile soap should be used, and the legs be well dried by the use of dry bran or saw dust.

A wet horse should be rubbed dry with wisps of dry straw before putting on the blanket or leaving for the night; slight walking exercise under cover would be beneficial in such cases.

Singeing by the use of a lamp is done to remove long hairs from the jowl and thighs.

Clipping is a very useful process in horses that grow a very heavy coat of hair during the fall and winter; such animals when worked sweat freely and are apt to get chilled unless clipped, colds and lung troubles resulting from the sweat being retained in the hair. Horses that are blanketed continually while in the stable seldom require clipping, the tendency of such clothing being to render the hair fine, thin and glossy; show cattle are clothed for the same purpose as are show sheep. Some people make a practice of clipping the back and sides of horses, leaving the hair on the limbs and belly. Clipped horses should be blanketed when forced to stand outside.

Inflammation and its Signs. When speaking of sick animals certain terms are used, supposed to be intelligible to everybody; the word inflammation is often used, and when used alone means practically nothing; information is only afforded when one states where that inflammation occurred, e. g., the expression, inflammation of the lungs (pneumonia) means that the inflammatory process involved the lungs; pleurisy, inflammation of the pleura involved that membrane, and so on; inflammation of the bowels (enteritis), of the peritoneum (peritonitis), of the liver (hepatitis), of the kidney (nephritis), of the womb (metritis), all tell the listener the location of the trouble.

The inflammatory process is liable to occur in almost any part; a brief description of the changes taking place in that part will be interesting. Inflammation is the succession of changes taking place in a living tissue, the result of injury, provided that injury is not severe enough to at once destroy the vitality and structure of the tissue;

briefly it is the reaction of the tissues after injury. **The signs of inflammation,** viz.: Pain, heat, redness and swelling are familiar to all: the pain being due to the pressure on the nerves of the part, the redness and heat to the increased supply of blood at the part, the swelling to the exudation of lymph. The process is as follows: The blood supply to a part is increased, the circulation eventually becomes slower, and the blood vessels engorged; the red cells accumulate in the center of the stream, and owing to the pressure there is escape of the white cells and some of the plasma. The injury becomes repaired in several ways, these white cells may absorb the wasted material and be taken away by the lymphatics, or the cells of the part may absorb the white cells: if the white cells are too numerous to be thus removed, they may die and be thrown off as matter (pus). If the exudation into the tissues is allowed to remain there, it will coagulate, due to the fibrin, and as a result formation of fibrous bands (adhesions) which may cause permanent enlargement of a part; thus interfering with its movement, circulation and therefore its nutrition. The best way to remove the exudation is by applying pressure to the parts, this must, however, be done before the exudate becomes solid.

CHAPTER XIV.

BREEDING AND SOME OF ITS EFFECTS.

The stockman is dependent on the offspring of animals for his main source of income, consequently their birth and after treatment together with treatment of the dam both before and after giving birth to the young animal become of great importance to him. Accidents at birth, diseases of the new born, abortions, all tend to reduce his profits, consequently to minimize loss he must know how to prevent and meet disease.

The reproduction of the young constitutes the science of **Obstetrics;** while generation is a natural healthy process, domestication has more or less interfered with its natural healthy ending; various diseases often occur which consequently call for treatment. The earlier stages of obstetrics, such as the signs and duration of heat, the process of conception, the time employed carrying the young (gestation) have been discussed; parturition, or the act of bringing forth the young and the subsequent treatment of dam and offspring will now receive attention.

Pregnancy. It is important to know the signs of an animal being with young, or as it is often expressed, pregnant; such are increased docility; a tendency to fatten; a depraved appetite (tendency to eat dirt, etc.); and a cessation of heat, not always infallible. Other signs more significant are shown towards the latter end of the

pregnancy, namely, slowness of action, enlargement of the belly and of the udder, presence of milk in the udder, and movements of the fetus in the dam, the latter being shown after feeding or drinking, especially of cold water. During the period of gestation (carrying the young) the treatment of the dam should be natural, plenty of exercise, not of a violent character, good nutritious food, easily digested and of a slightly laxative nature; no mouldy, spoiled food or grasses with ergot or smut on should be used. The drinking water should be pure and not ice cold, the stables should be clean and free from odors; pregnant mares seem to be very easily affected by smells. Mares should have light work towards the end of the pregnancy, and should not be used to saddle or asked to back loads or work in slippery places at that time. Some horsemen make a practice of feeding a small quantity of wheat to in-foal mares during the last few months of the pregnancy. Kindness should be the only treatment meted out, together with plenty of pure air and exercise, with an avoidance of fattening as far as possible, and by so doing keep the muscular system in good tone; if too much succulent food is given ewes with lamb the lambs are apt to come soft and flabby. No purgatives (except to cows liable to milk fever) should be given to pregnant animals and surgical operations should be postponed until after delivery. Mares may be worked safely right up to foaling; I have myself done so, removing mares from the harness to bring forth strong, healthy foals. Cows are usually dried about six weeks before the time of calving. The careful stockman will have in his breeding book the date at which gestation will be ex-

pected to end, and for a short time previous to that time the dam should be given a clean, roomy, well bedded box. Special farrowing pens have been constructed for sows, the principle being to protect the young pigs from the sow lying on them, a board ledge six or eight inches wide around the stall, securely nailed about one foot from the floor is a common way of protecting the young pigs. Valuable mares are generally watched at the time of parturition so as to render assistance at once; the faithfulness of the shepherd at such a time (lambing) has been the theme of writers, from a financial standpoint it pays, as a chilled lamb is soon lost, a ewe with her first lamb often needs assistance; especially as some animals refuse their young and have to be coaxed to take them, for which various methods have been devised. Dr. Reed of the O. A. C., Guelph, Can., recommends a little brandy rubbed on the lips of the mare inclined to disown her foal, and also rubs some of the liquor on the foal.

The time of parturition has arrived according to the breeding book, which contains the record of service, etc., there are, however, symptoms shown by the pregnant animal, which afford reliable indications of the nearness of the act. The swelling of the external genitals (vulva), enlargement of the udder, hollowness of the rump, especially in cows, of the space between the pin bones and the tail head, wax on the teats in mares, a flow of milk, making of the bed by sows, glistening appearance of the udder, uneasiness, a desire for solitude, slight pains gradually increasing, followed by the pushing forth of the water bag and the possible escape of its contents show that labor is not only close, but that it has started.

Delivery. If all goes well the head and fore feet are presented (sometimes the hind feet) and the young animal is in a short time in a new world. The natural delivery in mares is of short duration, only five to fifteen minutes usually elapsing after extrusion of the water bag; the cow may take one to two hours to deliver the calf, extending to that many days. Ewes take about fifteen minutes to deliver or less, and if twins are present the interval between births may be from 15 minutes to two hours or even days. Assistance should not be offered until the water bag shows.

The sow takes a variable time to deliver, depending on the number of pigs—may take from ten minutes to several hours. In natural cases little assistance is needed, and when given should be of the right kind; the attendants should only apply traction when the young animal is in the right position, and only when the expulsive effort is being made; the direction of the traction should be away from the back bone, that is towards the hocks of the dam, downward if the animal is standing. The foal is often born in its membranes, and should be released immediately from them, especially about the head; any mucus present being removed from the mouth and nostrils. The membranes of the calf and lamb do not always follow right after delivery; in the cow they remain for days; in the ewe rarely so; while in the sow it is the exception for such to occur; the reason for retention of the membranes in ruminants (cow and ewe) is due to the peculiarity of the attachment of the membranes in those animals, which will be remembered from the description of arrangement of the mucous (lining) membrane of the uterus in those animals.

Difficult Deliveries. If the presentation has been right, the usual labor is of short duration, if, however, the pains have begun and persisted for a long time without delivery, some hindrance to the normal delivery may be suspected, the cause of such unnatural happenings are numerous; may be due to wrong presentation, such as two hind legs and one fore leg coming together; the animal coming upside down, or with the head turned back, excess in volume of the fetus, contraction of the genital passages, enlargement of the head, due to tumors, etc. In such cases the employment of a veterinarian *is advisable* and *profitable*, because he is acquainted with the parts, has the proper instruments and drugs. The time of calling the professional man should *not* be left until the dam is exhausted or injured internally from the movements of the fetus; the *longer* such cases are left the *greater* the danger of inflammation of the womb or tearing or wounding internally of the dam. If the stockman is sufficiently expert let him bare his arm to the shoulder, anoint with carbolized oil—one part of carbolic acid to ten of linseed oil—introduce the arm into the passage and endeavor to find the cause of the trouble. If a head and one foreleg are shown fasten ropes (one-fourth inch) on the parts, push them forward into the cavity and then try and get the missing limb, raise it and bring all into

FIG. FORCEPS.

the natural position, the head between the two fore feet; if the head is down and the fore feet presented, rope each foot, push them forward and try to raise the head and bring it towards you along with the feet. The stockman will on examination, better understand the conditions than from any written directions, and will be successful according as he adapts himself to meet these conditions. Mares and cows are more easily delivered when in the standing position; if they lie down the work becomes harder to perform. In cases of difficult delivery in ewes an assistant may be got to hold the ewe with the hind legs up in the air, the head down, thus throwing the bowels downwards and consequently giving more room to work, or the ewe may be turned on her back, but kept in this position only for a short time. In animals running overtime Nature is generally allowed to take its course; it might be advisable in mares that have gone overtime, and who have had milk in their udders for a few days, to attempt delivery.

Attention to the Newborn. The treatment of the young animal is not very formidable, as stated; remove the membranes, clean out the mouth and nostrils; examine also to see if the newborn has the natural apertures for the passage of urine or feces. In some cases attention to the navel and its cord are necessary, especially in the foal, the navel string should be cut about one and one-half inches from the body and securely tied and thoroughly dressed with some good antiseptic daily, until it dries up, shrivels and drops off. In lambs, calves and pigs slight scraping of the finger nail on the cord will sever the string and prevent bleeding. If life seems

about gone, whip with a wet towel, work the fore limbs, breathe into the nostrils at intervals coinciding with the limb movements, pull the tongue gently forward, then let it retract and again pull forward, repeating the movements at intervals for ten or fifteen minutes or longer, rub the body dry, and bring to a warm place, a slight stimulant such as brandy and water or a little sweet nitre and warm milk may also be given with benefit. Get the newborn to suckle as soon as possible so that it may get the action of the first milk (colostrum) and thus remove the meconium—the accumulated excrement of fetal life. The meconium may have to be removed; use the oiled finger, or injections of warm water and oil; avoid giving purgatives: foals are often started scouring, and are lost as a result of giving such medicine. A heaped teaspoonful of fresh (unsalted) butter may be given to the foal with good results if a little constipated; if a ewe refuses her lamb the one refused (in case of twins) should be rubbed over with the one taken, or if one is dead, skin it and put the skin on over the one refused, or put the ewe and refused lamb together by themselves for a time. In case of ewes the wool should be trimmed from around the udder to allow the lambs to get at the teat, this will also prevent the lamb sucking the wool, with the result sometimes of wool-balls in the stomachs. After getting the young animal to suckle once, leave the dam and offspring to themselves; if the afterbirth has come away, remove and bury; the disgusting practice of letting animals eat the membranes should not be permitted. The usual practice with dairymen and stockmen with dual-purpose cows, is to remove

the calf a short time after birth—two days—the calf being fed whole milk for four weeks and then gradually changed to skim milk, the feeding being done three or four times daily, the quantity at the start being about two pounds at each feed.

The treatment of the dam after delivery will determine to a great extent the growth and development of the offspring, if the dam is limited in quantity of food, or poor quality given, the offspring will be weak, stunted or of slow growth. Keep the dam comfortable and do not annoy with many attentions, if at all chilled, blanket, give warm mashes, laxative food (grass, clover hay, bran and oats) milk and water with the chill off for a few days. If intending to show foals the dam had better not be worked, if not the dam may be worked for a quarter of a day, later half days until getting back to the usual routine, if worked the foals should be placed in boxes together and fed, entire rest from work should be allowed mares for at least a week after foaling.

So far the conditions after delivery have been considered as normal, unfortunately for the stockman such a happy termination is not always the case, as such complications as retention of the afterbirth, inversion of the womb, bleeding from the womb, garget, milk fever, may affect the dam, and scours, navel-ill, constipation, indigestion may affect the offspring.

Retention of the afterbirth (fetal membranes, placenta). This condition, while rare in the mare and sow, is comparatively common in cows for reasons already mentioned; if, however, retention does occur in the mare, skilled assistance should be obtained and the removal of

the membrane be accomplished inside of 24 hours. Removal of the membranes by hand in sows would be difficult owing to the smallness of the genital passage, for such purpose 1 to 2 teaspoonfuls of fluid extract of ergot, repeated if necessary in half an hour, will often have the desired effect; in ewes Stewart recommends an infusion of laurel berries and aniseed. The membranes may be left in cows without ill effect for two or three days, a longer time especially in warm weather should not elapse before removal is performed; if left for a longer time putrefactive changes begin, the cow falls off in her milk, the appetite gets poor, she gets dull and feverish, and smells badly, shows loss of flesh and may eventually show signs of blood poisoning due to absorption of the products of putrefaction; a cow once allowed to show the symptoms stated is hard to bring back to her natural good health, in fact is usually ruined to all intents and purposes. Removal should be performed somewhat as follows: bare the hands and arms, and anoint with carbolized oil; never neglect this precaution or blood poisoning and death may be the result; introduce one hand and with the fingers loosen the cotyledons separately by running the first and second fingers each side of the cotyledon and the thumb on top, press down with the thumb and lift with the fingers, thus practically skinning the membrane off the buttons (cotyledons); before removal of the membrane a button feels very smooth, after removal it feels rough to the touch; the other hand should be employed to take up the slack, thus gradually removing the afterbirth; considerable time is necessary for the proper performance of the work when one is told that

there are about 100 buttons on the uterine surface. If a large portion is extruded, a weight may be attached and the membranes come away of themselves: after removal the womb should be flushed (syringed) out with an antiseptic, such as permanganate of potash, 1 oz., water 2 quarts, or creolin, 1 part, water 50 parts. If a feverish condition exists, determined by the use of the thermometer, the flushings should be given daily, as shreds of the membrane may have been retained. Animals in good condition are not as liable to this condition as those underfed, or aborters. Some stockmen feed whole oats to cows for a week or two before calving as a preventive; a new and comparatively cheap method of treating this trouble said to render traction unnecessary consists in the administration of half pound doses of brown (Demerara) sugar in a pint of wine, repeated at twelve hour intervals, the womb injections also being given in cases in which there is any discharge or offensive smell.

Inversion of the womb, casting of the withers is a serious condition, especially in sows, mares and ewes, and as a rule necessitates the employment immediately of the veterinarian. It may be due to a rough delivery or prolonged labor, too much traction on the membranes, poor condition due to lack of feed, or as a result of standing with the hind end lower than the front end. The stockman may have to return the organ and should prepare himself as for removal of the afterbirth; have the animal kept on its feet, then cleanse the womb with an antiseptic solution, containing also laudanum 2 oz. to the quart of the solution, removing any part of the afterbirth that may be attached; then by doubling his fist

and applying it to the center of the mass press it steadily and gently forward, when the animal strains being content just to hold his own; if the straining is severe, pinch the back, put on a tight, strong girth or give a large dose, 2 oz. of laudanum; when the organ is returned to its place a rope truss or wooden pessary may be applied to keep it there.

ONE FORM OF A TRUSS.

A pessary is a very satisfactory instrument to use, and may be made as follows: Take a smooth stick three feet long, 1½ inches in diameter, at one end tie clean rags around to make it the size of one's fist, at the other end bore a hole through the stick, through which a ¼ inch rope may be passed; the large end is passed into the genital passage until it fits snug against the neck of the womb, the rope passed through the other end is by its two ends fastened to a neck collar and is thus held in place. The length of the rope required will vary with the length of the animal; the pessary should be smeared with vaseline or clean sweet lard at the large end, Straining after the return of the womb may occur, and if continued may be due to the organ not having been returned to its natural position or else to the presence of some of the membranes. A certain amount of straining is bound to occur, the result of the introduction of the pessary; such may be overcome by a dose of some anodyne, e. g., laudanum. Pigs' bladders and

bottles have been used as pessaries, being allowed to remain in position for seven to ten days.

Bleeding after delivery (hemorrhage) is not easy to control and needs the attention of the veterinarian.

Garget (inflammation of the udder, mammitis), is a condition occuring in milking animals, often the result of carelessness or ignorance, and serious to a greater or less degree in the immediate symptoms and the probable results. The specific causes are: injuries, exposure to cold, oversecretion, retention or injection of milk, introduction of germs, from dirty milkers, unclean bedding and quarters. Its prevention in animals during the weaning period is not hard, the methods are as follows: Mares need to be milked out occasionally, or the foal limited as to the number of times it suckles each day, some mares are irritable if attempts are made to milk them, and they may need the application of the twitch; by putting them to work, limiting the food and giving that food dry, the secretion of milk will usually cease; if however, it persists, the veterinarian should be asked to prescribe. Cows dry easily as a rule, too easily for the majority of people; it may be necessary to milk several times daily after calving to avoid the trouble. Ewes need careful attention at weaning time, and should be milked for two or three successive mornings, then one or two milkings at intervals of one day, then later at intervals of two days: as a rule, at the end of that time they are dry, the secretion of milk having stopped. The proper position in which to milk a ewe is as follows: Get her with her head in a corner, then straddle her, and by bending over the shepherd can reach each teat

with his hands; if the ewe goes to back up a slight pressure with the chin at the tail head arrests the movement, which if forward can be checked by pressure with the knees of the milker. Sows are dried up by gradually removing the pigs, taking away one or two at a time, the process taking about a week or ten days. If the offspring of any of the animals mentioned are unable to take the milk supplied, it should either be milked out by hand or by another animal.

The symptoms are: Swelling of the udder, either of one or more quarters, there is considerable heat and pain present, the parts being very sensitive to the touch, the skin may be reddened, and a swelling along the belly; thick, ropy and bloody milk may be discharged, the supply of milk from the affected part being less than usual, the udder feels hard to the touch, rise of temperature as shown by the thermometer. The treatment needed in mild cases will only be a thorough rubbing with clean sweet lard, fresh unsalted butter or oil; recovery will, even in these cases, be hastened by a thorough bathing for forty-five to sixty minutes with water as hot as the hand can bear. Let the offspring suckle or else milk out frequently; if very painful use a clean metal milk tube (teat siphon). The following liniment is very useful after bathing or poulticing the udder:

Fluid extract of Belladona	½ ounce.
Tincture of Aconite	4 ounces.
Tincture of Opium	3 ounces.
Raw linseed oil to make	1 quart.

A dose of purgative medicine is also very useful in cutting short an attack. In severe cases some antiseptic

should be added to the bath; the bathing being performed two or three times daily. Teat siphons should be boiled occasionally, and each time of using should be soaked in some antiseptic for ten minutes; the teat siphons should be oiled before introducing up the teat. A useful application for garget in ewes is lard and turpentine mixed to a creamy consisteney. The loss of a part of the udder is often the result of garget; the animal must be watched at the next delivery as the teat may be plugged; sometimes stricture of the teat is the result, in such cases a dilator will be needed. Darning needles and goose quills should not be used, as the delicate lining of the teat may be injured and closure of the teat be the result. Bloody milk may be considered as a symptom of garget.

Milk Tube Self-retaining.

The contagious form of garget calls for similar treatment with the plentiful use of antiseptics in addition.

Milk fever, parturient apoplexy, parturient paresis, (the latter term the more modern,) is the bane of the dairyman, it is a disease peculiar to the cow and *only attacks heavy milkers:* a cow in fleshy condition before calving is predisposed to the disease. Many theories have been advanced to account for the disease; the latest, that of Schmidt, being the one most generally accepted; he claims that a morbid process goes on in the udder by which poisonous material is produced which is absorbed. The sooner this disease appears after calving the more fatal it is; it generally follows an easy, rapid delivery.

The symptoms are well marked, every dairyman being more or less familiar with them, probably the first seen is a slight unsteadiness of the gait, crossing of the hind legs and a swaying motion when walking; later on the head droops, no notice is taken of the calf; there is stamping of the feet and whisking of the tail, paralysis comes on; the cow becomes stupid and the eyes dull, and may lie on the breast bone, with the head around to the flank or else flat on the side. The breathing is loud, the urine and feces are retained and rumination (chewing of the cud) ceases, the amount of milk given is lessened, and in bad cases bloating may occur.

The most satisfactory treatment is of the *preventive* order, by limiting the quantity of concentrated food and by giving a purgative dose of salts just before and immediately after calving. Schmidt's treatment is highly lauded; it consists of the injection of a drug (iodide of potash) into the udder by means of a funnel to which is attached rubber tubing and a milk tube.[1] One or two drams of the drug are dissolved in one pint of cold boiled water, one-fourth of the amount being siphoned into each teat, the udder being well hand-rubbed after the injection; a one-ounce dose of aloes is also given if the cow is conscious. The udder injection may be repeated twice or three times in the day; reports of this treatment seem to indicate that two injections at the most are sufficient for the usual cases. The following treatment has been very successful in the hands of Dr. Hugo Reed, of Guelph, Canada; it is:

[1] Other investigators recommend Chinosol or a half pint of a 5 per cent solution of lysol as the udder injection.

Gamboge	1 ounce.
Ginger	4 ounces.
Common salt	½ pound.
Epsom salt	1½ pounds.

Dissolve the above in three pints of water and give as a drench, give through a rubber hose, six feet long, ¼ inch in diameter, passed into the stomach, by this means avoiding the frequent cause of death in these cases, namely, passage of the liquid the wrong way. One hour later give:

Chloral Hydrate	2 ounces,
Bromide of Potash	2 ounces,

dissolved in a little water, one hour later, one-fourth of the quantities above mentioned are given, repeated at three hour intervals. The patient should be kept well bedded and propped up on its breastbone (sternum), the milk drawn occasionally, the urine and feces also being removed at regular intervals, the latter by means of injections.

Dropping after calving (sometimes termed wolf in the tail) occurs in some herds and is best remedied by the use of nerve tonics, it may occur previous to calving if the dam is at all weakened or has been fed innutritious food. Hollow horn, wolf in tail and other diseases of that nature in cows due to starvation, are not diseases of the various parts as the names would indicate, hence these so-called diseases are never found in herds in charge of good stockmen.

CHAPTER XV.

DISEASES OF YOUNG STOCK.

Constipation is a common trouble in foals the first few days after birth, the food of the dam just previous to delivery not having been of a laxative nature or the first milk (colostrum) was not taken by the foal, will thus account for this trouble in the majority of cases. Calves, lambs and pigs are rarely troubled, as they usually get the first milk. The signs of this trouble are straining, rolling, lying on the back, colicky symptoms, the belly tucked up; the foal sucking in a half hearted way, and the non-passage of feces are also reliable indications. The preferable way to overcome the trouble is to diet the dam, changing to food of a more laxative nature, e. g., bran mashes with flax seed; the use of purgatives on a foal of such a tender age is extremely dangerous. The finger may be oiled and introduced into the rectum, the contents of a dark tarry ball like nature removed; or a cone of soap may be placed in the rectum and left there. The injection of one-half ounce of glycerine or two ounces of raw linseed oil in two or three ounces of water is very useful and may be used in preference to the soap or oiled finger. Lambs should be watched their first two weeks of life, as the feces tend to stick to the wool around the anus and thus form an obstacle to the passage of the dung.

Scours (or diarrhœa) is as a rule more or less serious, the contagious form in calves, termed calf cholera or dysentery being especially so. The common causes of scours is the food, either as to its quality or quantity, or regularity in giving it. In foals the disease is often due to the use of purgatives to overcome the preceding trouble (constipation); the drinking of warm stale milk, the mare being worked and the foal only allowed to suckle at long intervals; too rich or too much milk. We may then consider scours in any animal a symptom of indigestion, not as a disease in itself; the looseness of the bowels being one evidence of Nature's endeavor to overcome the trouble. In calves especially is scouring due to over feeding, feeding at too long intervals and the use of milk of a poor quality. Lambs sometimes scour if the ewes are on pasture of a watery nature, green oats, etc. The disease is soon evidenced by colicky pains, refusal of food, sour smelling passages, the passage of watery feces with rapid loss of strength, in some cases curdled milk is mixed with the dung.

The causes being known the first thing in the treatment is to remove those causes; if the disease is seen in its earliest stages give as one dose:

Laudanum	1 dram.
Tincture of Catechu	1 dram.
Castor Oil	1 ounce.

The dose may be larger or smaller depending on the size of the animal (see dose table p. 137). Lime water in one or two ounce doses fed with the milk is useful in overcoming acidity and the consequent indigestion. Foals affected with indigestion due to the dam's milk being

too rich should have the supply limited, the mare being milked on the ground, and a dose of pepsin given; raw eggs with brandy and several other drugs are often recommended. Subnitrate of bismuth in suitable doses is a very valuable drug when the digestive tract of young animals is in an irritable condition.

Navel-ill is rather a common disease of foals, occasionally of calves and lambs. The measures to be adopted by the stockman are those of a preventive character, such as dressing the navel with antiseptics; have the mare to foal on the grass, and if the disease has appeared, the thorough disinfection of the foaling or calving box or the lambing pens, as the case may be. The symptoms shown are feverishness and constipation, loss of vigor, being quite dull and reluctant to suck; and lameness with swelling of one or more joints. The latter symptoms, lameness and possibly a swelling of a joint mislead the average stockman, he thinks the foal has been stepped upon by the dam, when really the cause is the introduction of germs by the navel. The navel, instead of drying up and dropping off, remains on and is clammy to the touch and tap-like in appearance. The later stages exhibit more swelling of joints, formation of abscesses and exhaustion usually terminating in death. The urine may trickle from the navel in this disease. The early employment of a veterinarian will only be profitable; the death rate is high on account of skilled treatment being given too late. Some authorities consider this trouble as caused by the same germ as that causing contagious abortion.

FAILURE TO BREED AND SOME OF THE CAUSES.

Hindrances to reproduction are many in number and varied in their nature, some diseases may render the female passages unfit for the fertilizing element of the male; the indiscreet use of the male may have caused the male fertilizing element to lack vigor or be absent entirely; malformations, or the actions of the animals before and during mating, may also interfere with proper fertilization, thus constituting sterility or barrenness; it must be understood that the fault is as likely to be in the animals of one sex as of the other.

Sterility or barrenness in males in the majority of cases is due (1) to lack of exercise, fleshiness and the too frequent use of foods of a stimulative or fat forming nature; (2) next to these causes, is overindulgence and masturbation, due to ignorance or cupidity of the owner; (3) old age, (4) change of climate; (5) spasm of the urethra, tuberculosis or diseases of a weakening nature, and in (6) stallions, poor handling at the time of mating. The causes being known the cure is evident, no drugs will be of use unless the cause is removed. In addition to the removal of the cause, either (1) or (2), give

Pyrophosphate of Iron	1½ ounces,
Phosphide of Zinc	48 grains,
Nux Vomica, powdered	1 ounce,

mixed and made into twenty-four powders, one to be given in the feed three times daily; if due to cause (2) limit service (see p. 77), or use a shield to be got from dealers in racing harness supplies, and give exercise; acclimation, which requires a period of one year to ac-

complish, will overcome the trouble if due to cause (4 spasm of the urethra, or proudness, as it is termed b. horsemen, a condition in which the penis remains erect after mating, requires the use of cold water along the course of the urethra and the veterinarian to prescribe, in some cases a second service overcomes the condition, which in the first instance prevented the proper discharge of the semen. Cantharides (spanish fly) must on no account be given by the stockman.

Sterility or barrenness in females is due to a similar number of causes such as (1) fleshiness and lack of exercise; (2) a closure or (*b*) a flabby condition of the os (neck of the womb); (3) malformations; (4) prolonged continence; (5) acid condition of the vagina, the result of abortions; retained afterbirths, etc.; tuberculosis, in and in breeding, hybrids are also responsible for inability to produce offspring. Sterility, due to cause (1), may be overcome by bleeding or the use of a purgative; a treatment quite commonly followed by old country breeders is that of bleeding mares a short time before mating; if failure to conceive is due to causes (2) an examination will need to be made, the animal is securely tied or otherwise restrained, twitched or one fore foot lifted, the hands and arms bared, oiled and belladonna applied to the fingers, which are formed into a cone, then the endeavor is gently and gradually made to dilate the neck of the womb, which done, mating may take place in mares; if due to (*b*) the use of the gelatin capsule, a method introduced by Mr. Jas. Johnstone, of the Breeders' Gazette, Chicago, will be found very useful, in fact in mares hard to get with foal the capsule method is worthy of a trial,

results in the hands of several breeders warrant an extended use of the capsule for this purpose. The capsule method is as follows: Procure a gelatin capsule (Planten's are good) one-half or one ounce capacity, then have the mare served by the stallion, immediately afterwards insert the capsule (with the cap removed) into the vagina, dip up with it the semen; the capsule containing the semen (fertilizing element of the male) is then carried forwards and passed through the neck (os) into the womb, where it is left; this method is likely to be very useful in those mares that eject the semen after a service. The condition of the lining membrane has been mentioned among the causes, impregnation is not likely to occur if there is any discharge from the vagina, the injection of a solution of boric acid, permanganate of potash or baking soda one ounce in three pints of clean water two hours before mating may overcome the acidity, which is immediately fatal to the spermatozoa. Chronic bulling in cows is best treated by spaying and fattening for market. **Sterility** (barrenness) in sheep or rather a **small lamb crop** may be due in addition to the causes already mentioned as affecting either sex, to the ewes being left undocked or untagged, thus preventing the proper performance of the act of breeding; the latter operation (tagging) should be performed every year just at the beginning of the breeding season.

CHAPTER XVI.

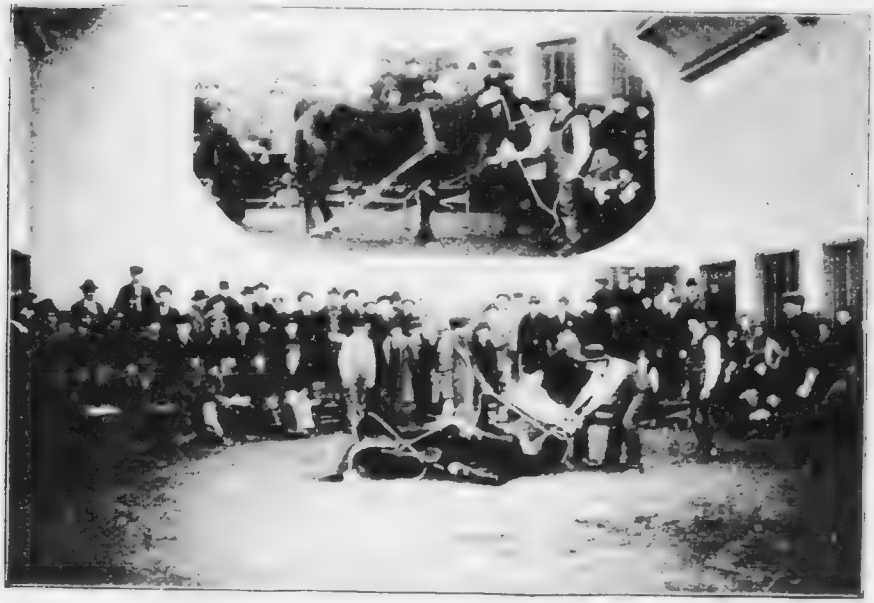
THE COMMON FARM OPERATIONS.

Securing animals for operations. Methods of Restraint—As the stockman's patients will not listen to reason they have to be tied or otherwise restrained for all operations, in **horses** we have the twitch, noose twitch and rope twitch, the side line, the throwing harness and the stocks.

The twitch, consisting of a loop large enough to pass the hand through (one-quarter inch rope), is fastened to the end of a stick, piece of a fork-handle about two feet long, the loop applied to the upper lip and twisted several times. The rope twitch is generally known as the Bonaparte bridle; take a rope, make a simple knot at one end, eighteen inches from which make another knot, so that the first knot can pass through its loop, thus having a loop at one end of the rope, run the free end of the rope through the noose, a simple form of halter thus being made place the loop in the mouth, the halter part over the head, make a half hitch with the free end of the rope, pass it over his head and under his upper lip, draw moderately tight. The noose twist consists of a rope with a loop which will not run, at one end, the other end is passed over the upper part of the neck, under the upper lip and through the noose which should be high up on the cheek.

The side line consists of a rope, hobble and a collar; the hobble is applied to one hind foot, the rope attached

and run between the forelegs and up through the collar, then down through the hobble and up on the outside of the limb through the collar again, the attendant raises the leg as desired, and holds it in that position by grasping all the two outer ropes at the level of the shoulder joint. The throwing harness varies with the operator, a cheap outfit consists of a strong surcingle, with iron rings,



THROWING A HORSE FOR OPERATIONS.

two hobbles, about forty feet of three-quarter inch rope, and a couple of strong leg straps, hame straps may be used. The surcingle is put on the animal, a long rope applied to the headstall, run through a ring on the back, the holder standing well in front of the horse; the near forefoot is tied up to the surcingle if it is desired to lay

the animal on its near side; the operator pulls steadily on the rope, thus drawing the head toward the off flank, when the horse will lie down and can be tied securely with the hobbles and ropes, the former being placed on the hind feet, which are drawn up to the body and tied as desired; the other foreleg may be strapped to the surcingle also.

Cattle can be secured by the bulldog forceps in the nose, by passing the tail in front of one hind leg and then

A STEER ROPED FOR THROWING.

The front hitch should be lower down the neck, the back hitch should be six inches further ahead to obtain the best results. Thirty feet of rope is required.

drawing backwards on it, or by throwing, for which a long rope is required with slip noose at one end, which is fastened to the head or horns, the free end being passed around the body two or three times to form half hitches,

by pulling steadily on the rope the abdomen is compressed and the animal lies down, where it may be secured by fastening the halter and the fore feet to a strong, securely set post, the hind feet being secured somewhat similarly. **Pigs** when large are best secured by placing a noose over the upper jaw and fastening to a strong post; if small can either be placed on their backs, an attendant sitting straddle of the neck, facing the hind parts of the

HANDLING SHEEP, (WISCONSIN AGRICULTURAL COLLEGE).
1—Holding. **2**—Milking. **3**—Trimming feet and position for drenching. **4**—Catching. **5**—Throwing.

pig, or the pig can be grasped with both hands, each hand holding one fore and one hind leg, the back of the pig being pressed firmly against the holder.

Sheep are usually caught by catching in the flank with the hand of the same side and turned by the shepherd,

who half kneeling on the near side places his left arm in front of the sheep's breast, his right hand at the same time passed under the belly grasp the off leg just above the hock, pulling steadily with his right hand the sheep is placed on its rump, on which it is revolved, the shepherd rising to take the position at the animal's back, its head between his knees. **Lambs** are held in a similar position to that described for small pigs, for such operations as docking, castrating, etc.

There are certain operations that the stockman is frequently called upon to do; simple though they are certain precautions are necessary to ensure the greatest amount of success, the animals usually affected are not of sufficient value to justify the expense of a veterinary surgeon. The principles governing the healing of wounds should be understood, with the changes that go on in a part during repair; such an understanding will prevent the injudicious use of drugs such as caustics, irritants, etc., and will impress on the stockman that no materials he may apply will heal a wound, but that Nature heals, and that his treatment or that of the surgeon is only in the nature of assistance. Once that fact is thoroughly appreciated, wounds can be scientifically and therefore successfully treated. The inflammatory process has been described; following that he will often find that pus (matter) is present in wounds, the bacteriologist will tell him that pus is the result of germs that have obtained entrance to the wound, and when one remembers that pus is made up of dead cells, destroyed by those germs, the methods of wound treatment are simplified and the stockman has also mastered the principles of

what is known as the Listerian or antiseptic treatment of wounds. Lister was the father of antiseptic surgery, the adoption of which has reduced the mortality resulting from wounds to very small proportions. Wounds heal in various ways, depending on the severity of the wound and the manner in which it was inflicted: examples of varieties of wounds are (a) clean cuts as made by a sharp knife, these as a rule heal readily; (b) punctures caused by running of a blunt body into a part, such as the point of a shaft, repair of this variety is slower and the injury is more serious than the first kind; (c) lacerations, tears such as wounds made with a saw or jagged edged instrument; repair is slow in these wounds and pus is usually abundant; (d) bruises in which case the skin is rarely broken.

Manner of healing of wounds:

1. **By immediate union,** the parts are brought together in exact contact and unite at once; there is very little material needed in this case, therefore any inflammation present must have been slight.

2. **Union by first-intention,** in this form the divided edges are glazed over by a fluid (lymph) thrown out from them, or the clotting of a thin film of blood; this material holds the parts together until permanent union by cells takes place; the fluid has to be got rid of before permanent healing takes place, a scar results from this and the following method. The lymph thrown out becomes vascular, i. e., little (capillary) blood vessels form in it.

3. **Granulation** is the commonest form of healing in the lower animals, it is a tedious process accompanied as

a rule by the formation of pus: in this form lymph is thrown out, it accumulates, blood vessels form in it, cells cluster around the vessels constituting granulation tissue; the upper layer of lymph cells is destroyed and thrown off as pus, it has, however, served to protect the deeper layers which form a tissue resembling that of the part, gradually the discharge of pus ceases, a new surface (the scar), white in color, is formed, which gradually disappears and the wound is said to be healed. If the inflammation in a wound is unchecked, or there is lack of pressure, the small vessels, capillary loops, become distended with blood and constitute what is known by every one as proud flesh (granulation tissue). Two other methods of healing are *by union of two granulating surfaces*, and *under a scab*. All wounds heal essentially in the same manner, viz., by the growth and organization of new tissue from the already existing older tissue of the parts.

The general treatment of wounds may be briefly stated as follows: First to stop the bleeding and remove any foreign substance, such as dirt; second, to protect from germs; third, to bring the parts as closely together as possible, keep down excessive inflammation, and prevent the accumulation of discharges. A wound is said to be healthy when it looks like a clean cut; unhealthy when it is pale, covered with pus, small clots of blood or proud flesh; inflamed or angry when hot and of a dark red color; indolent when the process of healing seems stopped before the proper time, e. g., a sitfast. It may be stated as a general rule that if a wound continues dry, and not ill-smelling, looks healthy, etc., that it should not be

interfered with, but if pus forms it should be washed clean once or twice a day with clean warm or cold water, a syringe or piece of cheese cloth (do not use a sponge, the cheese cloth can be burnt after once using), then apply some antiseptic solution or dry antiseptic powder.

Control of bleeding (hemorrhage) is the first thing to do in connection with wounds, as the animal's life blood may very soon flow away, if the bleeding is from an artery; bleeding from veins as a rule is seldom dangerous, unless the animal is in an already weakened condition: sometimes bleeding is arrested by the contraction of the muscular coat of the artery; an artery partially cut through will continue to bleed, when if entirely cut across the bleeding will often stop, owing to the fact that the muscular contraction mentioned becomes possible. Surgical methods of stopping bleeding are by the use of forceps performing torsion (twisting), in this form the divided end of the artery is seized by the forceps and twisted until it breaks loose from the forceps; the emasculator and ecraseur are instruments partially working on this principle, they crush the coats of the vessels; tying, or ligating, as it is termed, silk, twine, catgut or other materials are used for this purpose; *styptics* are occasionally used, they cause clotting of the blood and thus stop the flow mechanically, for such purposes tincture of iron, turpentine and other drugs are used; the hot iron (cautery) is also reliable for this purpose, in docking and castrating of lambs, and sometimes in horses, in the larger animals bleeding may occur when the scab left from the burning falls off, usually about seven days after the operation. The use of dirty materials, such as cobwebs, earth,

etc., is dangerous, as these materials often contain germs of various diseases, e. g., lockjaw (tetanus). Hot water (above 110° F.) or ice cold water will also stop bleeding, warm water encourages it. The hands should be cleaned and dipped frequently in the antiseptic solution when dressing a wound. Stitches are not used as frequently as formerly in wounds of animals, the powerful muscular contraction tends to tear them out, in cases of severe wounds the veterinarian should be called. The use of such irritants as acids, turpentine, salt, etc., serve no useful purpose on a fresh wound when compared with the pain caused, such materials really tend to hinder and thus prevent rapid healing, their use is also liable to result in permanent scars or blemishes.

Another class of wounds to deal with are those known as fractures (breaks), they occur in hard structures, such as bone, differing from those already spoken of, which are of soft tissues.

Fractures require expert dressing and the application of bandages and splints in the larger animals: in calves, lambs, pigs and poultry the stockman can with little trouble bind up the broken part and save loss. Fractures (breaks) are of various kinds and vary greatly in their seriousness; generally speaking, if the ends of the bones extend through the skin, the case is not worth bothering with. Fractures may be straight across a bone, on the slant (obliquely), or lengthwise; if the bone is broken, without external wound, it is termed a simple fracture; if the broken ends do communicate with an external wound we have the compound fracture; if the bone is broken in small pieces the fracture is known as com-

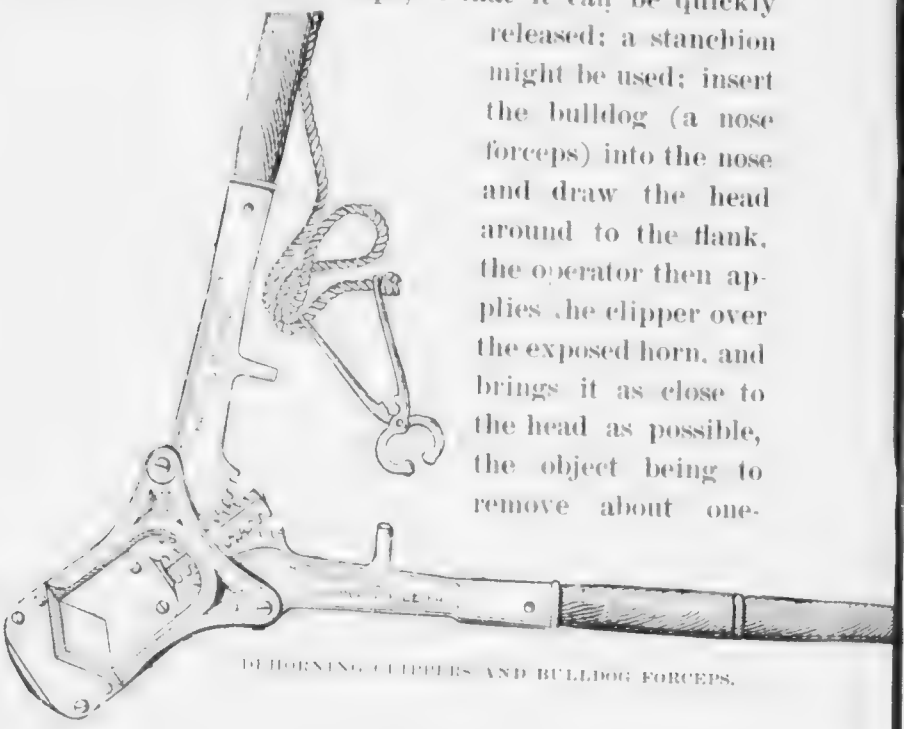
minuted; greenstick fractures occur in young animals, and resemble the break in a green stick, not a clean, sharp break, hence the term.

Union of fractures (broken bones) takes place somewhat as follows: During the first three days inflammation and exudation is going on, from then to the twelfth day soft material is thrown out around the broken ends, and if the bone is hollow also in the hollow space; by the end of a month if the ends have not been disturbed the soft material mentioned is changed into bone (being known as the provisional callus), following this stage, material forms between the broken ends, being later converted into bone, which process takes about two months, thus completely uniting the broken parts; this material forms what is known as the definitive callus; if occasional movement of the ends occur during this stage, complete union is not possible, and in such cases the material thrown out instead of becoming bone takes on a gristly formation. The absorption of more or less of the excess of callus follows, usually taking several months or longer to be performed, before this occurs the point of union is shown by an enlargement. Briefly the treatment of fractures consists in bringing the broken parts together, securing them in that position by splints and bandages, usually left on six to seven weeks, drainage and antiseptic treatment of the fracture if a compound one, entire rest of the patient for at least three months, in a well-bedded (short material, such as cut straw, shavings, sawdust, being used) box, give good, nutritious, laxative food and plenty of green meat if available. Fractures may be detected by the presence of sudden, severe lameness,

deformity of the part, which can be moved in unnatural directions, great pain, fever, and the grating (crepitus) of the ends of the bones together. Fracture of the tibia (bone of the lower thigh) sometimes occurs without displacement, being held in place by the strong periosteum. Fractures in old horses are always dangerous, in younger horses there is possibility of repair, if given proper treatment and nursing; fractures of the hind legs are more serious than those of the fore ones, in the former if above the hock, unless in very young animals, are usually not worth treating. Surgical operations are better avoided if possible during fly time or in animals far advanced in pregnancy.

Dehorning is a surgical operation usually performed on cattle, by which they are rendered more tame, and consequently more easily handled. My experience is that if properly done bad results are very few; cattle will often go right to eating; some cows will not even show any appreciable shrinkage in their milk; for the control of bulls this operation is indispensable. The operation is best performed during cool weather, so as to avoid flies, during the period from October until April; best results are obtained in yearling and two-year-old cattle. The instruments in general use are the clippers or saw; I prefer the former as being handier, calling for less restraint of the animal, and if kept in good shape, well-oiled and sharp, do just as good work, only in a great deal less time. Bleeding from the operation is rarely serious; in heavy milking cows it may sometimes need attention.

Smear the hair at the base of the horn with vaseline and turn it back, then secure the animal to a strong post by means of a chain or rope, so that it can be quickly released; a stanchion might be used; insert the bulldog (a nose forceps) into the nose and draw the head around to the flank, the operator then applies the clipper over the exposed horn, and brings it as close to the head as possible, the object being to remove about one-

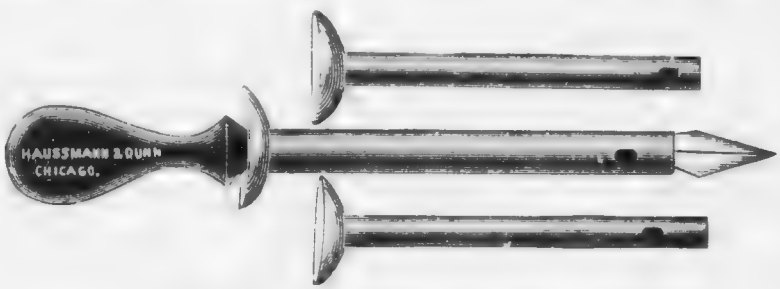


DEHORNING CLIPPERS AND BULLDOG FORCEPS.

fourth inch of the skin along with the horn, thus destroying the horn matrix and preventing the growth of unsightly stubs. To make a nice-looking head be careful to so apply the clippers that the cut will slope inwards from the bottom of the horn base, thus a pointed poll, resembling that of the Angus, will result. As soon as the horns are removed pieces of cotton batting about one to one and one-half inches square dipped in boracic acid (a powder) are placed right over the wound, the

hair is then drawn over the batting and fine string (parcel) tied around the poll, thus holding the batting in place. Calves may be dehorned by caustics, of which several varieties are on the market; a cheaper method, just as good, is to buy caustic potash in the stick form at the drug store. It will be necessary to wrap cloth about it when using or the fingers will also be cauterized. it is applied around the base of the horns, just where they join the skin.

Tapping the first stomach or paunch is performed in cattle and sheep when badly bloated, the instrument used being known as the trocar, a pointed rod, and the



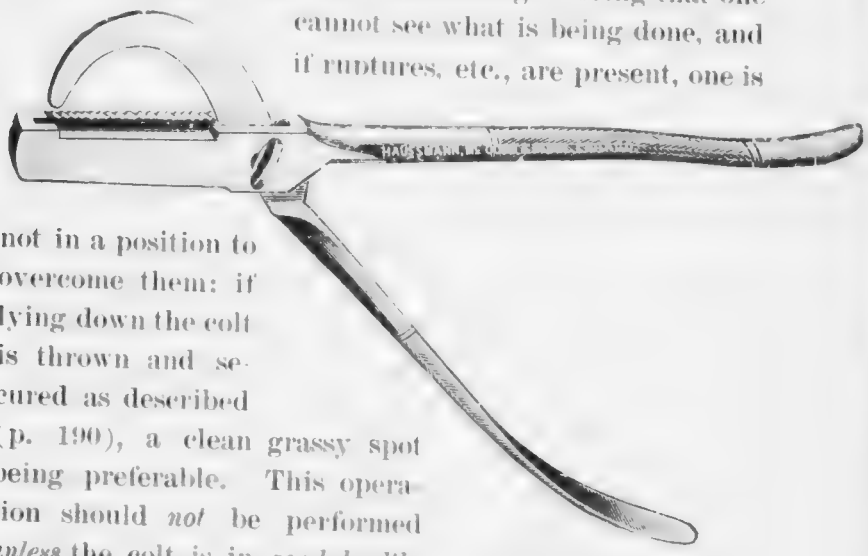
THE TROCAR AND CANULA AND BULL PUNCH

canula, a hollow tube; it can also be used for ringing bulls. The operation is performed in the upper left flank at a point equidistant from the point of the hip, the last rib and the bones of the loin, the instrument being applied to the point described, is given a sharp tap and pushed in its full length, the trocar withdrawn, the gas then rushes out of the canula, which may be left in for five or ten minutes. The paunch is the organ tapped in cattle and sheep: the tapping of horses should be left to the veterinarian. Rumenotomy is an extension of this

operation for the removal of food in cases of impacted rumen; the operation when done, consists of the opening and removal of its contents and sewing up by the veterinarian, it should *not* be left to the eleventh hour: good results follow when performed early and with antiseptic precautions.

Simple wounds of teats may be treated antiseptically, the use of strips of adhesive plaster to draw the wound edges together will often be found satisfactory.

Castration is usually performed on colts, at a year old; if light in the neck and forequarters they may be left until two years. The operation is done either in the standing or lying position; the first is hazardous and requires an agile and expert man, the disadvantages being that one cannot see what is being done, and if ruptures, etc., are present, one is not in a position to overcome them: if lying down the colt is thrown and secured as described (p. 190), a clean grassy spot being preferable. This operation should *not* be performed *unless* the colt is in *good health*, the results are better if a run at grass for a few days has first been obtained. The instruments needed are the emas-



EMASCULATOR.

culator and a castrating knife, which should be placed in an antiseptic solution ten minutes before operating, the hands and arms being also cleansed with the same material, it is also good practice to examine the parts for ruptures, etc.

The **essentials to success** in castration are: *thorough cleanliness*, got by the plentiful *use of antiseptics*, *good health* at the time of operation; and *exercise* afterwards. The scrotum is seized between the finger and thumb, so as to tighten the skin over it, and a good incision (four inches or thereabouts) made over the testicle, right through the coverings of the testicle, which will then pop out. The emasculator is applied well up on the cord, the rough edge to the body, and the handles closed, the testicle removed, the operation being repeated similarly on the other testicle. Some of the antiseptic may be poured into the wounds, the colt let up and stabled for eight to ten hours, when it should be turned out with the others, if a mature horse, hitch and give a short drive or slow work; if cold rains occur the colt must be stabled. The wounds should be examined occasionally in order to see that they are kept open, thus insuring the drainage away of any pus. It should be remembered that the testicles of colts may not descend until twelve months old, sometimes as late as two years old.

Bulls are castrated standing, the head being tied up solidly to a strong post, an attendant at each side steadies him, the operator stands squarely behind the bull, seizes the scrotum, gives it a half turn round and draws it out between the hind legs, the incision is made from nearly the top to the bottom of the sac, the testicle drawn

out and removed with the emasculator or the cord is scraped slowly with the knife until severed: the remaining testicle being removed similarly. **Calves** are thrown down, the end of the scrotum cut off, the testicles drawn out until the cord breaks or is scraped as before. **Lambs** are castrated in a similar way, being held as described for small pigs, the knife or docking shears may be used for taking off the piece of the scrotum, which may be left any length desired.

Rams are castrated similarly to bulls, or by turning. ["With the ram, you have him turned upon his haunches, clip the wool off the scrotum to get it out of the way. Have some one hold the ram and hold the hind feet up pretty close to the body, unless you wish to go to the trouble of tying. Take the end of the scrotum in one hand and with the other press the testicles well up into the body so as to tear them loose from the end of the pouch, you can usually feel them give way, now bring them down and taking them one at a time invert them and revolve them three times around the cord or until it is twisted tight. This you will find is not the easiest job until you get on to it. You can tell when the cord is twisted tight by passing the finger along and feeling the spiral condition and the hardness. When you get one twisted let it draw up into the socket so it will not turn back right end up, while you operate on the other one. Having them both done tie the sac close up with a soft cord. Tie tight enough to prevent them coming down and turning back. Cut the strings off after 24 to 36 hours."—Curtiss and Edgerton, Iowa Agricultural College.] In this method germ infection, so much

dreaded in rams, is avoided. Another method lauded by some, and which has been tried at the Station (W. E. S.) is to tie a strong cord around the sac or cod as close to the body and as tight as possible, three days later the sac and stones are cut away about an inch below the cord and an antiseptic applied to the cut end.

Caponizing is the operation performed in removing the testes of poultry.

Spaying or castration of females may be performed in the sow, bitch and cow, rarely in the mare unless a bad (vicious) actor (e. g., switcher and kicker) in harness, the surgeon should be called to operate on mares, and *unless* the stockman is expert on the heifers also. Females thus operated on fatten more readily and are not subject to the periods of heat; if a sow it is placed on its right side and secured, the upper hind leg being stretched backwards, an incision is made vertically just below the region of the loin, the hand passed in up towards the back and the ovary felt for, when found is drawn towards the opening, thus drawing the horn of the uterus also, rendering the other ovary easy to get in young sows, both ovaries are drawn out and snipped off at once, if old sows only one is exposed at a time and its ovary removed. The operation may be performed on the cow or heifer in the standing position, the incision being made through the upper left flank at the spot selected for tapping a cow, a strong scantling being slung parallel to the cow at a level a little above the knee and hocks, the head should be fastened securely and the bull-dog may be inserted in the nose. The incision is made with a knife through the skin, the operator can with his

fingers secure the ovaries which are snipped off by the spaying scissors, and then brought out. The incision should be just large enough to admit the hand, a stitch or two through the skin, muscles and peritoneum draws the wound together, tar being applied over all. The animal should be starved for thirty-six hours before the operation and should only get light sloppy feed or grass afterwards for a few days.

Ruptures may occur in pigs and lambs, if shown after castration, cleanse the bowels with tepid water containing some mild antiseptic, return them, to do which it may be necessary to stand the animal head downwards, and also to introduce the finger into the rectum, when returned sew up the opening as close to the body as possible, keep quiet and give but little food. The navel rupture (umbilical hernia is the technical term) is often seen in foals, and quite frequently disappears by the time the animal is a year old; previous to that time the enlargement may be blistered, some cases recovering from that treatment; if, however, it persists beyond the age stated a good surgeon should be employed.

Entires and geldings are sometimes ruptured in the region of the groin (inguinal hernia), and the rupture may even extend down into the scrotum in any male entire, constituting what is known as scrotal hernia, in the latter case the skilled surgeon's help is needed; the former trouble (inguinal hernia) is often the cause of severe colicky symptoms in stallions, and, if not relieved, becomes fatal; the symptoms are as follows: Suddenness of attack, colicky pains growing more intense all the time, arching the back, lying on the ground or sit-

ting up like a dog, pawing the ground, sweating heavily; the cord (spermatic) will be thickened and the scrotum feel cold to the touch, in such cases give a large dose of laudanum, three ounces in half a pint of raw linseed oil, if possible throw and turn the animal on its back, and after oiling the hand introduce it into the rectum, and by gentle traction inside and working outside the bowel may be returned.

Scirrhus cord is a disease of the cord (spermatic), the result of fungus invasion following castration; my experience has been that all the cases seen had been operated on with clamps; if the cord becomes imprisoned between the lips of the wound made at castration this condition may result, hence the necessity for examination of the parts a few days after castration, the wound should then be bathed with a warm antiseptic solution, *the operator's fingers being clean*, and if the cord is in view, as described, it should be pushed up into the scrotum. The symptoms of this enlargement (so much that people say the animal was not castrated) of the cord are, discharge of pus for months after the operation, straddling gait, some stiffness of the hind quarters and even loss of flesh; for this condition give Iodide of Potash, one to three drams daily, according to the age of the animal; if that does not cure after two to three weeks use of the drug, the surgeon's aid will need to be invoked.

Bleeding of Animals has gone out of fashion the result of the swing of the pendulum from the other extreme; it has, however, its advantages, and at such times is very beneficial, especially in such cases as founder (laminitis), congestion of the lungs and brain troubles; it should

never be performed during such sickness as colt distemper (strangles), influenza (pink eye) or other weakening diseases. When done the blood should be taken from the jugular; bleeding from the feet should not be allowed as germ infection, resulting in lockjaw, etc., is liable to occur. The near side is the most convenient on which to operate, the animal should have been blindfolded previously, and the head raised enough to smooth out the skin of the neck; the incision with the fleam is usually made down the neck about ten to twelve inches from the angle of the jaw, the fleam being sharp and clean so as to make a good-sized cut, rapid bleeding being the most beneficial. Raise the vein, by applying pressure over it below the point of operation, either with the thumb or a fine cord drawn tight around the neck. Dampen the hair over the spot to be incised; place the fleam blade parallel to the vein, running in the same direction that is: tap the back of the fleam firmly and the blood will flow out: it should be collected in a pail so that the amount removed may be known; on an average three to four quarts are sufficient to take away; the pulse will also be a guide as to the quantity to be taken: enough blood having been taken, a pin is run through the edges of the wound, a horse hair or piece of fine twine being wound around it in the form of a figure 8; the pin can be pulled out in a few days.

Docking consists of the removal of a portion of an animal's tail; it should only be performed for sanitary reasons, as in sheep, especially ewes; or to overcome a dangerous habit in horses, such as seizing the reins with the tail, in which case **nicking,** cutting of the muscles which

lie under the tail and whose action is to draw that member down, might be preferable: the surgeon should be the one to decide and operate in horses: in many States the operation, unless a surgical need, is illegal, and rightly so. The stockman will have to dock his sheep, which is done when they are lambs, either with a sharp knife, or the red hot docking shears. To do the job well one man holds the lamb as already described: that is holding a hind and fore foot in each hand, its head and back being pressed firmly against the holder's body, keeping the lamb in a position so that its buttock inclines out toward the operator, who will, if operating with the knife, feel for the joint, which found will be cut through with one clean cut, the lamb being at once released: the tail should be left quite short, in fact about level with the outer end of the skin that comes out from near the tail-head to join that organ: if with the forceps (Wing's) they are heated to a dull red heat, an assistant holds the tail out straight and the forceps are applied and slowly pinch of the tail: effort should be made to let the forceps lean over a little so as to sear the artery, which is on the center line of the under surface (in the position in which the lamb is held, of course being the upper side) of the tail. The lambs operated upon with the knife should be *carefully watched* at intervals to avoid their death from bleeding, if bleeding is excessive the artery should be caught with a small pair of forceps and given a few turns, or a hot iron be applied. Docking is best done when the lambs are three weeks or a month old: the operation of castration following a week or ten days later.

CHAPTER XVII.

DISEASES DUE TO MISTAKES IN FEEDING.

The observant stockman has probably noticed that the veterinarian's cases are largely the result of mistakes in feeding animals by their owners. he will have noticed that diseases seen on the farm, such as colic, stoppage of the bowels, indigestion, shown by scouring, milk fever, etc., are more common than all other diseases affecting farm stock, unless we except the contagious diseases hog cholera and contagious abortion: such being the case a few of the most common will be described:

Colic is worthy of being classed with the poor, by some farmers, as it is always with them, and while of such common occurrence, none the less serious: usually of short duration it is not thought much of by the average owner, yet we find that the colics of long duration are often quite dangerous, and also those that recur, inevitably end in the death of the patient, therefore all the more responsibility is thrown on the feeder, when it is considered that *colics are due to mistakes in feeding.* We generally speak of two kinds of colic, the *spasmodic or cramp* colic, and the *wind* or *flatulent* colic, for all practical purposes we may, and shall here consider them as shown by similar symptoms, with this exception that in wind colic a bloated condition exists, due to the formation of gas in the intestines. A horse affected with either of the colics will be uneasy, may paw the bedding

or ground, arches the back, looks around to the flank, and attempts to lie down, kicks at the belly and rolls on the ground, seems to improve and will go to eating and remain that way for a short time when the spasms again affect him and the symptoms are repeated as before; it might be mentioned that the quiet spells are not shown as plainly in wind colics, in which disease the pains are more continuous and the breathing hastened and difficult, due to the pressure of the distended bowels on the diaphragm, which pressure affects the lungs, limiting the area for those organs to do their work. Rubbing the belly seems to afford relief; colic cases often recover without treatment; it should be remembered that colic, strictly speaking, is not a disease, but a symptom of pain in the intestines. The pulse is usually full and frequent; there may be patches of perspiration on the body. **Unfavorable symptoms** are a cold, wet, clammy condition of the body, high temperature, haggard expression of the face, frequent, hard small pulse, together with difficult breathing; if the animal passes urine it may be considered a favorable symptom, as showing the spasms have relaxed, must have done so to release the sphincter muscle at the neck of the bladder; in this connection it may be stated that horses are *seldom* affected with urinary troubles, although the above symptom often misleads people, who say: "the horse has something the matter with its water," when such is not the case.

Treatment should be immediate, one of the following prescriptions may be used:

A	Laudanum	2 ounces.
	Turpentine	2 ounces.
	Linseed oil	1½ pints.
B	Chloric Ether	1 ounce,
	Indian Hemp Extract	ounce.
	Water	1 pint.

Or we may substitute Sweet Spirits of Nitre for the turpentine; either prescription may be given as a drench for colic. Do not repeat prescription **A**; if the animal is not relieved **B** may be given an hour and a half or two hours later, and if the animal's condition is not improved at the time of giving the second drench, *do not neglect to call your veterinarian* (a graduate of course). Injections

INJECTION PUMP.

of warm water—about two quarts—may be given at two hour intervals, the stall should be kept well bedded, and the animal prevented from throwing itself violently, while in some cases walking exercise might be useful; do not distress the patient by galloping.

Bloating in sheep and cattle, sometimes termed *hoven* or *tympanites,* is common where green corn and rape are fed, it may be due to choking, the presence of some

foreign body in the paunch (rumen), or if chronic to tuberculosis.

The most prominent symptom is the bloating of the animal, especially noticed on the left side between the last rib and point of the hip; if pressure with the finger is made the impress is at once lost as soon as the finger is removed; in impaction of the paunch the impress is not removed at once, hence this symptom aids in distinguishing one disease from the other; the breathing is difficult, as might be expected from the pressure on the diaphragm; there is also moaning and slavering from the mouth.

The treatment is first to tap (see farm operations) with the trocar and canula and thus draw off the gas, then follow with one of the following drenches:

Turpentine..... 2 ounces,
Linseed Oil..... ..... 1½ pints,

or,

Spirits Ammonia..... 1 to 1½ ounces,
Linseed Oil..... ..... 1½ pints,

to be followed in a few hours with the usual cattle purge and sloppy diet, **sheep** will only need one-fourth of the above doses; if much pain is present one to two ounces of laudanum may be added to either prescription.

Remember the injunction with respect to drenching sheep or cattle: "Drench slowly and carefully and let the head down *at once* if the animal tries to cough." To avoid this trouble (bloating) do not pasture cattle or sheep on clover or rape when immature (then in a very watery condition) nor when there is a dew or rain drops lying on it, wait until dry and then turn the stock on

with some food in them, *never* in a hungry condition. The latter precaution is always well to observe and it is also a good method when first putting stock on the feeds mentioned to leave on for a short time, one-half to two hours only, *neglect* of these precautions *means* certain *loss.*

Distension of the paunch also occurs in sheep and cattle due to getting an overfeed, say from getting loose at grain either in the barn or the field, dry fodder and no succulent feed (such as roots or silage) from stoppage of the bowel movement. The symptoms are similar to those shown in bloating, only that the swelling pits on pressure (on the left side) and tapping with the fingers does not give the drum-like sound as heard in the preceding disease; chewing the cud (rumination) stops and the animal is said to have lost its cud, here again we have a symptom mistaken for a disease, if digestion is going on properly the cud so-called will be present, so that the loss of the cud as termed by many people, is a symptom of digestive trouble and needs investigation as to the cause, *not* the giving of a so-called cud, of pork, greased rags or unwholesome materials; if this condition has existed for a day or so, no feces (dung) will be seen to pass.

The treatment calls for a smart purge, followed by stimulants, and injections, and if all these fail to relieve, an operation by the surgeon, who should be called for such a purpose *not later* than two days from the onset of the trouble.

Choking in cattle is usually due to the attempt to swallow whole potatoes, pieces of turnip, old shoes, etc.: in

horses from bolting the feed such as whole oats or from hard physic balls, pieces of roots, pressure by the collar, or the formation of abscesses in colt distemper (strangles). In cattle the flow of saliva from the mouth, attempts to cough, bloating and the presence of the obstruction somewhere along the course of the gullet indicate the trouble; in horses the nose is poked out, the neck is stiff, if attempts to drink are made the fluid is discharged through the nostrils, there is slavering, an anxious expression, difficult breathing, the horse may drop to the ground, and the presence of the obstruction.

The treatment in cattle is comparatively simple and successful; the bloating is first relieved by tapping, an oiled probang or piece of twisted rope is passed down the gullet and endeavor made to push the obstacle on down, a little oil poured down occasionally, or before the use of the probang, is also useful, an assistant may also gently try to work the obstruction downward if seen; do not use a whipstock unless very flexible or a torn gullet and death may result.

In horses small doses of oil and water may be given, providing the animals are given the head free so as to avoid the material going the wrong way; if from the collar remove and use one of the proper size and fit. The *veterinarian* is almost *indispensable* in cases occurring in horses, as chloroform may have to be given and an operation performed.

Founder (laminitis) is included under diseases due to errors in feeding, although it frequently occurs from driving on hard dry roads, excessive purging, sudden checking of sweating by giving very cold water when

heated; hard work when not in condition, or it may follow foaling or lung troubles, and occasionally from standing too much on a limb in order to save another which may be injured. *Excessive feeding* for the showring or block, etc., *with lack of exercise:* wheat especially when green, or breaking loose and getting at grain in the bin are other common causes. This disease may appear in cattle and sheep, although the pain shown will not be as acute as in horses. The symptoms of laminitis are so well marked that once seen they are never forgotten, a horse affected will stand immovable in a stall with his fore feet away in front of him, his weight being thrown on the heels, if the hind feet are affected they and the fore feet are placed well under the body, the animal if made to move rocks on its limbs and will jump with both fore feet together, the pulse is hurried, throbbing of the arteries below the fetlocks can be felt, if an attempt to lift a foot is made the animal resists, the feet are hot and tender, especially if tapped with a hammer, the breathing is hurried, giving rise to the suspicion that the lungs are affected, the pulse is full and hard, and the membrane of the eye reddened (congested). Sweating will be seen as a result of the extreme pain and thirst will be great, the thermometer will show an increased body temperature. *The treatment* needs to be energetic as unless so, destructive changes will take place resulting in dropping of the sole, due to the pedal bone turning point downwards, pumice foot and possibly shedding of the entire hoof. Irregular rings around the foot, close together are evidences of an attack at some time, as is also the tendency of a horse to travel on its heels when trotted.

Bleeding is very useful in such cases, either from the jugular, or from the coronet, never from the toe, there is too much danger of germ infection; tub the feet in warm water or apply hot poultices for a few times. Purgatives such as aloes should not be given, a quart of linseed oil will be useful and safe to use, in these cases if bleeding is not performed aconite may be used with care, following its use with saltpetre (nitrate of potash) in ounce doses, twice daily in the drinking water, until the fever subsides. Bran mashes or other light food is to be preferred, some veterinarians remove the shoes, which is not always easy unless the animal is made to lie down, which should be done if it persists in standing. Do not pare through the sole, but as soon as the worst symptoms are over, in three or four days, give moderate exercise, being guided, of course, by *the veterinarian* if one is employed, which *is advisable* in a horse of any value, as he will know how *to prevent* the serious *after troubles* already mentioned. Many horses are spoilt for city work by this disease, unless some of the various rubber pads are used; a run at pasture, a moist one preferable, after blistering the coronets is a great help to restore the foundered animal to usefulness. This disease in sheep or cattle will be more common during the summer if high feeding, without taking into consideration the temperature, or putting on full feed too suddenly is persisted in, more is to be gained by prevention than by cure, if such animals are affected doses of glauber salts are to be given occasionally, the doses being the same as of epsom salts.

Lymphangitis, big leg, weed, or water-farcy (not a good term, apt to be mistaken for farcy), is another serious trouble due to errors in feeding, the lymph channels and nodes are inflamed, consequently their working is more or less hindered, over-feeding, lack of exercise or sudden change to large quantities of a new food, etc. It might be considered as a disease in which the lymph has stagnated (stopped moving) in the lymph vessels, these vessels it will be remembered acting especially as carriers of waste material from various parts, hence this stagnated material acts as a foreign object with the result inflammation of the organs affected.

There is excessive swelling of one or more limbs, oftenest a hind one, the swelling extending from top to bottom of the limb, which is hot and painful to the touch: running the hand down the inside of the limb the lymph nodes are felt, the temperature is above normal, great lameness, rapid breathing, hard full pulse, the lymphatics are seen to be enlarged; owing to the cause, lack of exercise, it is oftenest seen on Monday morning, hence it has been termed Monday morning fever. Attention to the diet, bran mashes every Saturday night containing a tablespoonful of saltpetre will almost certainly prevent the disease. A horse once attacked is liable to have the trouble recur and as a consequence a chronic enlargement and thickening of the limb (elephantiasis). This disease must not be confounded with ordinary stocking up of the limbs which is painless; or with the local form of glanders, termed farcy, a very dangerous disease, both to Man and animal to have anything to do with.

The treatment should be directed towards the cause and its effect, therefore limit the feed, give a purgative, aloes preferably, to remove the accumulated waste products which have in the form of lymph escaped more or less into the tissues, and if left there may coagulate and thus give the chronic thickening so often a result of this disease. Bathe the limb with warm water, thus relieving the tension and pain, better not to bleed; hand rub and bandage the limb when the inflammation is subsiding, and if the swelling is slow to depart, the use of iodides under the veterinarian's direction will often prove satisfactory. It is a good plan to suspect farcy in cases where the hind limbs swell, especially if the animal has been properly fed.

Azoturia is the oftentimes fatal result of good feed and lack of exercise, probably most common in the spring time, in farmers' horses; in cities appearing after a day or so enforced rest, due to holidays or storms; it is far more serious in city horses than country ones, owing to the fact of the steady, heavy feeding of grain and heavy work the town animal is subjected to. Percherons and their grades are said to be more liable than other breeds, due probably to their easier keeping qualities; in some cases exposure to cold may have caused the disease? The name azoturia, meaning an abnormal amount of nitrogenous matter in the urine, is rather misleading, as such a condition is not present at the beginning of this disease, what does occur is an increase in the number of red blood corpuscles, sometimes being present in twice the natural (normal) quantity, which are destroyed, thrown into the blood, and act as a poison: whatever the term used

the disease shows such symptoms as dark coffee-colored urine, excitement, spasms of the muscles of the croup, the driver often thinks that a limb is broken or the animal's back is sprained. The horse will leave the stable all right, in fact livelier than usual, a short time later perspires freely, gets lame on one leg seemingly unable to put weight on it, the muscles of the loin and croup swell and get hard, the breathing is hurried, and eventually the animal goes down and is unable to rise on its hind quarters, hence the non-professional speaks of this disease as "spinal disease, paralysis," etc. The preventive treatment already mentioned for **big leg** should be adopted for all heavy horses and rotund roadsters, especially those easy keepers. Once the disease has made its appearance energetic treatment is necessary, place in a well-bedded box, give a purgative, poultice or bathe the loins with hot water, a liniment may be applied afterwards, blanket so as to encourage sweating, empty the bowels and draw off the urine, turn frequently on its bed; give plenty of water to drink, and in a few days try and get the horse on its feet, slings may be useful in such cases. A noted German veterinarian recommends the use of one to one and one-half pounds of baking soda daily. The main *treatment* should be early *left to* the *professional,* the stockman devoting himself to get the patient into the best possible place for treatment and nursing; as a result of this disease wasting of the muscles (atrophy) of the loins and croup may result, in such cases months of rest out at pasture and an occasional blister will be needed to entirely restore the parts to their natural condition.

Heaves, or broken wind, is a chronic condition in which there is difficulty of breathing, the act of expelling air from the lungs taking longer than the act of breathing in air, *it is due originally to mistakes in feeding*, and an animal badly affected is rendered almost incapable of work.

The difficulty of breathing in this disease is due to a dilated condition of the lungs, owing to excess of air in the air sacs *or* in the tissue that surrounds the lobules, as a result the lungs are prevented from expelling all the air they should, hence less is taken in than would be if they were in a natural condition. The air cells may be broken into one another as a result of the violent coughing, whereas in the other form the air seems to enter the tissues during the intake of air into the lungs, in which case some degeneration has in all probability taken place in the lung tissue. *A full stomach and bowels interfere greatly with the action of the lungs*, and when filled out with food it is not surprising that this trouble occurs. At the commencement of the disease there is a spasmodic cough, later a suppressed short weak cough, with a double expiration, and the passage of wind by the anus. In ordinary breathing no aid is needed to expel the air, the natural elasticity of the lungs performs the work, in this disease the muscles of the abdomen are used, as is noticed by the heaving of the flanks.

While the causes of the previous troubles have been overloading the system, the cause of this trouble is more mechanical in its nature and may, owing to the feed that causes it, be a disease of the poor feeder's horse, **founder, big leg,** etc., being diseases of the horse belonging to the heavy feeder. The custom existing among so many far

mers of *continually filling a horse's manger with hay,* even hay ag them littered with it, *is one of the great causes of this disease,* especially is this so when the hay is of poor quality, hard and innutritious, the horse being given an extra quantity to make up for the deficient quality. Hard chopped straw, overripe rye grass, are all liable to cause this incurable disease being irritating in their effect on the stomach wall and delicate filaments of the tenth nerve, the nerve which controls the lung movement. thus the relation of feeding to this disease is at once more readily seen and understood.

Heredity may also be said to have an influence on the frequency with which this trouble shows in a breeding stud. Although treatment is only palliative it should none the less be adopted, such as feeding roots and grass, or some soiling crop in place of dry hay. Limit the feed and water, and let what is given be of the best quality, clean oats and hay free from dust, sprinkle the hay with water before feeding; in France the hay is dampened with molasses and water with good results. The feeding of boiled flax seed or four to six ounces of linseed oil daily are very useful and serve to keep the bowels and skin in good order. Clover hay is very unsuitable, clean, bright timothy is preferable; in mild cases improvement is frequently noticed when horses are taken from the East to the Western prairies. It is thought that the hard and irritating nature of the prohibited feeds affects the nerves connected with the stomach and lungs. The following is a useful powder:

Arsenic	2 drams.
Copperas	1½ ounces.
Nux vomica, powdered	2 ounces.
Sugar	4 ounces.

Mix and make into twenty-four powders, one of which may be given twice daily. Horse traders often try to hide the disease by giving a large quantity of lard in the form of balls, or a quantity of shot, either of these acting for a few hours.

Water trouble in rams and wethers, especially those being highly fed for show, is due to the formation of little stones (calculi) in the bladder or urethra. Many experienced shepherds claim it is due to feeding mangolds and sugar beets or drinking hard water; there are doubtless other foods also dangerous if an animal is fed heavily on them and *its exercise limited*.

Treatment is of little avail as a rule, saw palmetto may be tried in two dram doses, or sweet nitre in the proper amount. The drinking water, once or twice a week, of such animals should contain some saltpetre, one to two teaspoonfuls to each ram or wether, or boric acid in the same quantity may be used. Sometimes the stone may be found in the worm at the end of the penis, as soon as removed the urine passes and the animal is relieved. The symptoms are humping of the back, kicking at the belly, stretching out of the hind feet as if to pass urine, stamping, uneasiness, gritting of the teeth, an increased tendency to lie down, stops eating, and often a costive condition of the bowels; death occurs from the severe inflammation set up or from bursting of the bladder.

Fat wethers and rams are often affected with soreness of the end of their sheaths, due to continual lying down and the trickling of urine therefrom when in that position; an unhealthy looking sore is found underneath the moist scab; as the soreness may prevent their trying to pass urine it might aid in causing the previous trouble; the application of iodoform one part to boracic acid three parts after the removal of the scab will soon overcome the trouble; examination should be made frequently, however, and treatment given if necessary.

CHAPTER XVIII.

DISEASES OF THE TEETH.

The stockman is seldom worried with **tooth troubles** in sheep, cattle and pigs, and unless well informed is apt to think horses are just as free, such, however, is *not* the case. The slightest irregularity of the teeth will interfere more or less with chewing and masticating the food, quite readily understood if a person is familiar with the arrangement of the teeth. **No horse is exempt,** from colthood to old age the teeth are liable to need attention. There are general symptoms, such as unthriftiness, often in spite of good and liberal feeding and little work, there is dribbling of saliva from the mouth, ends of hay may be dropped from the mouth, water is let fall out when drinking, the horse may crib or windsuck, the feces may contain undigested feed, there may be swelling of the jaw, a partial refusal of food, loss of flesh; the animal may pull on the bit or refuse to take hold at all, and there may be swelling of the gums just behind the upper front teeth, if this symptom, not a disease, remember, is seen, the word "Lampas" is uttered and the cause of the trouble thought to be located, the swollen gums are perhaps torn with nails or burned with hot irons, but there is no improvement; to the well informed the cause is soon known—it is the teeth. Here *the veterinarian* with the proper instruments *is indispensable,* **the employment of a quack, a travelling so-called horse dentist,** or

the attempt to treat the condition by the owner or groom will be *unsatisfactory*, being cruel and worrying to the horse, even to the extent of spoiling his mouth for life. Everyone knows that the efforts of the expert human dentist are directed to preserve the teeth, not to insert false ones, even more important is this effort in the horse, false teeth in him not being practicable; a horse's usefulness, and therefore his life, depends as much on his teeth, or more so, than on any organ of the body, and while horse buyers only examine the front teeth to determine the age, the well-posted person will want to know the condition of the grinders, and whether any are absent or diseased. **The yearly examination of the horse's mouth** by the veterinarian *is* one of the *most profitable* investments that can be made by a stockman, as feed, flesh, and the resulting power to do the work will be saved. The period of teething, it will be remembered (see page 10) extends almost from birth until the horse is five years old, consequently the colt is *just as liable* to have tooth troubles as is an old horse; the milk (temporary) molars, or crowns as they are termed, are often retained instead of being shed at the proper time, especially during the age of two to four years, the symptoms already mentioned are present and the lining of the mouth may show a sore surface, the gums even bleeding, as oftentimes a crown becomes partially loose and its sharp and jagged edge will be pressed upon the gums during attempts to feed; the treatment is removal of those crowns, the smoothing of any sharp edges, soft feed, and in a few weeks the improvement is almost beyond belief.

Wolf teeth are evidences of evolution in the horse, showing his relation to the tapir and other animals, the reasons advanced for their removal, namely, danger to the eyes, is not tenable, as the eyes are never directly affected by them. They are usually removed as a matter of policy, by the veterinarian: they might, if very large, interfere with the bit; as the wolf tooth has a fang, it should be pulled, not knocked out, if its removal is decided upon. In the chapter treating of the construction and arrangement of the teeth, the differences in width of the upper and lower jaws of horses were commented upon, and the effect such differences, together with the natural slope of the molars (grinders), would have upon the process of chewing. The commonest trouble that the veterinarian is called upon to treat in horse dentistry is the presence of projections of the grinders, such projections causing sore mouths, slavering, the passage of undigested food in the feces, unthriftiness, sometimes very marked, indigestion, wounds of the tongue and lining of the mouth, side pulling on the bit, the manger often being covered with saliva.

The treatment is simple, calling as it does for the use of the float (dental file) and yet is *not simple enough* to warrant *the trusting of this work to the travelling quack* or *the majority of owners*, the veterinarian should be employed and after the removal of the projections soft feed should be given for a few days. **The average work horse will need this attention once a year.**

Decayed teeth often cause symptoms in horses which have in the past been mistaken for Glanders, Nasal Gleet; such symptoms as a stinking breath, together with a

stinking discharge from one nostril, quidding of the food, pain during chewing, shown by the animal snddenly stopping that act often to let some of the food fall from the mouth, holding the head to one side when drinking, loss of condition and perhaps a swelling of the jaw, or fistula of that bone; the only successful treatment is removal.

Cribbing and Windsucking are two diseases due to idleness or the habit may have started in the colt during teething; it is a very nasty vice and affects the condition of a horse more or less to its detriment. The application of a neckstrap when in the stable and plenty of work are so far the most satisfactory measures to adopt. These vices are considered as **unsoundnesses** in horses, therefore in the examination of a horse the edges of the front teeth should be looked at to see if those edges are worn or chipped, the impress of the neckstrap upon the hair may sometimes be detected, and the prospective buyer will draw conclusions accordingly.

Discharges from the nostrils are of common occurrence, some are quite serious in their import, other not so much so; briefly we may class them as follows:

1. If chronic and no smell, yellowish or greenish in color, sticky and from one nostril, often the left, suspect glanders.

2. If chronic and from one nostril, the discharge being of a stinking nature, suspect a decayed tooth.

3. If chronic from both nostrils, white, glossy, flaky, not sticky, more abundant during mastication, the discharge is likely from the guttural pouches.

4. If chronic, becoming of the nature of pus, and stinking, a catarrh, the bones of the head being affected.

Acute discharges are seen in common colds, inflammation of the larynx, bronchitis, pneumonia and lung gangrene (rotting).

Black teeth in pigs are generally removed, although so far no data have been produced to prove that they have an injurious effect on pigs. In very young pigs at a few days old, the tushes should be broken off, thus avoiding tearing or soreness of the sow's teats, a result of which might be garget and loss of the sow and pigs.

CHAPTER XIX.

FOOT AND LIMB TROUBLES.

Diseases of the feet and limbs are usually brought to the stockman's notice by the presence of lameness in the animal affected, therefore we are justified in considering **lameness** a symptom of disease in the parts mentioned, *it being an expression of pain in one or more limbs during movement.* While the lameness may be plain the location of that lameness is far from plain, and in many cases will perplex even the expert veterinarian; to aid us in the detection of the diseases certain symptoms have been noticed as accompanying certain conditions; e. g., if the animal is lame in the shoulder, the foot is kept behind its fellow, the limb and knee relaxed the toe touching the ground, the limb may be said to hang loosely and when brought forward it describes an out turn; the forearm is extended, the knee flexed and the foot is on a level or behind its fellow in elbow lameness.

Lameness may be shown when the foot of the lame leg is on the ground, e. g., in corns, when the foot is off the ground stiffness of the knee may be shown although little pain is evidenced. It is useful to know that lameness may be partially hidden (masked) in a horse by the manipulation of the groom, such as exciting him, showing him on soft ground, preventing the animal breaking into a trot by holding him tightly by the head and by keeping the sound side to the examiner. The lame

animal should be examined both in the stable and outside, in the latter case at both the trot and walk so as to properly detect the trouble: if the horse is sound he will stand squarely on the fore feet, with probably one hind foot rested alternately or if very tired a near foot and off hind foot will be flexed or vice versa.

Pointing is a term often used in connection with lameness; a horse is said to point with a fore foot if, when standing he keeps it in advance of its fellow, in which case the heel or toe may be raised or the foot placed flat upon the ground.

The novice is often perplexed to know whether the lameness is before or behind, according as the animal is trotted to or from him, and in this connection it might be mentioned that the head and neck constitute the balancing pole of the body, in lameness of the fore limb the head if free will be raised higher than usual when the lame leg, if a front one, comes down on the ground, a sharp turn to the right or left will also aid, as the weight will be thrown on the forehand: if the lameness is behind the head will be lowered when the limb is brought to the ground. The slow trot on hard ground with the groom a couple of feet from the animal's head, who is made to *go straight away*, will be the best pace at which to examine, if lameness in front is suspected have the animal trotted towards you, and note the movements of the head, the legs and the feet, then note the action from the side whether shortened or not, and if the actions of the muscles of the limb are understood the variations from the natural gait will be more readily understood. Uprightness of a fore pastern is symptomatic of lameness in

the foot of that limb, usually if the forepart of the foot is affected the heel is lowered, e. g., in Founder: if the back part is affected as in coffin joint lameness (navicular disease) the heel is raised, while if due to bad nail puncture or fracture, the foot may be lifted entirely from the ground: frequent lifting from one forefoot to the other is indicative of coffin joint trouble.

If lameness behind is suspected, let the animal be trotted away from you and watch for the limb on which the animal dwells and on which he puts his weight, as to which is raised the higher, whether a toe is dragged or not; then turn to the right about and left about, noticing whether any reluctance is shown to putting weight on a limb.

The spavin test may be given if hock lameness is suspected, by flexing the hock tightly, which is performed by lifting the limb up close to the body for a few minutes, the foot being let down and the animal trotted off smartly, if the lameness is due to spavin, the lameness will be more marked after giving the test, the horse sometimes going off on the hop. After a drive or warming up of a horse the lameness will often disappear, in such cases the examination should be deferred until the horse has cooled off, when the lameness will usually show very plainly. Horses often drive out of the lameness when warmed up, that is the lameness disappears, except when lame from **splints, sore shins, corns, founder** or **sprains.** Intermittent lameness, that is the animal goes lame one time, sound another, is characteristic of **rheumatism** or **navicular trouble.**

Lameness behind is usually in the hock; if in front the feet of heavy horses are usually affected, light horses being liable to affections of the cannons, tendons or ligaments as well as the feet. Wearing of the toe of a front shoe is symptomatic of navicular, of a hind shoe, spavin; if the heel is worn it is likely to be due to either founder or ringbone.

Shoulderslip, or as it is generally termed Sweeny is rather a common accident in young farm horses, especially among those employed in breaking new land containing bush or tree roots: the shoulder muscles are sprained and as a result wasting (atrophy) of the outer muscles takes place, and the animal is then said to be **sweenied.** This affection is easy to diagnose when once the wasting has occurred, the treatment is necessarily of long duration owing to the damage to the muscle cells, the wasted muscles usually take months to fill out. In the early stages bathing with hot water, and a high heeled shoe on the affected limb followed by repeated blisters over the shoulder will usually give the desired results; rest, the use of a breast collar and avoidance of the cause will also aid in recovery.

Wasting of these muscles may result from rheumatism or chest founder (navicular disease).

Sore shoulder and collar galls are very common on the farm and can best be prevented by having collars and harnesses that fit. A very good method is on returning a horse to the stable to loosen the back pad, collar or saddle, lift up and replace, leaving there for 15 to 30 minutes, the reason for so doing is that the parts under the harness are quite hot, and if the gear is removed at once

the parts become chilled and a congested swelling results unless a brisk rubbing is given the parts; the use of a strong solution of alum and water or salt and water to the shoulders after removal of the harness will serve to toughen the parts; if sores result they should be treated as ordinary wounds; in some cases they are slow to heal, e. g., at the top of the neck, in that case needing the stimulating effects of some blistering material to increase the blood supply to the parts, while the chronic sores of the shoulder often take on a hard toughened appearance, being termed —sitfasts—such a condition will need the surgeon's attention. A sudden swelling often results from the use of a collar too small, it is not an abscess containing pus, but a swelling containing serum, which on being let out resembles bloody water, such cases early require careful attention and the veterinarian in order to make prompt recoveries, if left they get hard and are a continual cause of sore shoulder, eventually calling for the knife. **Capped knees** are quite common in cattle, often the result of lack of bedding in the stalls, in the early stages bathe with hot water and apply a liniment, later on the knife or the insertion of a seton (a piece of tape) through the enlargement from top to bottom.

Splints are bony enlargements on the cannon which connect it with the small splint bones, and are the result of inflammation caused by concussions. Young horses are very liable, the scrub more so than the pure-bred, owing to the inferior quality of the bone (see page 5, anat.). In order to detect them, although in many cases they are easily seen, the finger and thumb are passed down over the small cannon bone, notice being taken of any varia-

tion from the smoothness of those bones. The lameness is due to the stretching of the periosteum during the throwing out of the bony material (splint formation), the lameness quite often disappears when once the splint is formed, and the enlargement may also disappear in the same manner that a callus does. The lameness shown is often out of all proportion to the size of the splint, those more serious are close up to the knee joint, exercise increases the lameness. If no lameness is evident do not bother the animal with blisters, etc., always let "well" alone, if lame give rest, reduce any inflammation with cold water, and thoroughly rub the parts firmly but gently with an oiled leather-covered piece of wood once daily, 15 minutes each time, if this fails the red mercury blister may be applied a few times at two weeks intervals. Splints are more common on the fore legs than on the hind ones, and oftenest on the inner side of the limb.

Scratches, mud fever, cracked heels, are relatives, all being a form of skin trouble of the limbs, often the result of too much washing, clipping the limbs, or an alkaline mud.

The parts should be thoroughly cleansed with warm water and castile soap, well dried, and clean, sweet fat (unsalted) rubbed in, or a little iodoform and boracic acid can be mixed with the lard in the proportion of 1 to 10 and applied; speaking of this trouble Capt. Hayes says "that the external use of water should be confined to the animal's muzzle, eyes, dock, and sheath." If any inflammation is present poultice with a turnip poultice or hot, dry bran; even in this disease avoid washing the limbs as much as possible.

Ringbone is a disease of the bony structure, occurring as the result of inflammation of the pastern or coffin bones, usually on the hind pastern, but may be found on the fore limbs. This trouble occurs in different locations on the pasterns, e. g., if affecting the joint between the two pastern bones is termed "high ringbone," if the joint between the small pastern and coffin bone is affected the low ringbone is said to exist, it is a serious condition. Sometimes the enlargement appears on the large pastern bone, and it is then termed "false ringbone." The bony deposit may be at the front or sides of the bones affected, and may cause lameness by interfering with the movement of the tendons or ligaments. Ringbones may be caused by a horse going on the toe, the result of spavin. It is important to remember that the pasterns may be rough, large and prominent at the joints and yet not be affected.

A WELL MARKED CASE OF RINGBONE.
L. P. B., Long pastern bone; S. P. B., short pastern bone; the bony enlargement at the joint is plainly seen.

the prominences noticed are to give attachment to ligaments and muscles, both pasterns should be alike. In the early stages there is a stiffness of movement of the pastern joints, and if in the fore foot a tendency to walk on the heel, the lameness being shown long before any enlargement can be noticed.

The only satisfactory treatment is the firing iron, followed with a blister, and *the avoidance of breeding* from *sires or dams with this disease.*

Sidebones is the apt term used to describe the turning into bone of the lateral cartilages, which change may be partial or complete; as will be remembered these cartilages are of a gristly nature and yield more or less under pressure with the fingers and thumb. Heavy horses seem to be the ones mainly affected, and in connection with this fact concussion can hardly be the cause, injury from stepping on one another, and **heredity,** greatest of all, are the probable causes. The symptoms are lameness with a stilty action and shortness of the gait, hardening and enlargement of the cartilages.

The treatment is not satisfactory, blistering and firing doing good only in the earlier stages. A bar rocker shoe with frog pressure, fomentations and rest, later work on soft ground, will be about the best treatment, some people have the animal nerved if the lameness continues; *above all do not breed from a stallion with sidebones,* and if judging throw out a stallion so affected always.

Thrush is a disease of the frog usually following lack of pressure to the frog and consequent lessening of the blood supply: from the dung and urine being allowed to accumulate in the feet, or too much moisture.

There is often lameness, and an offensive smell from the affected frog, in some cases it has a cheesy-like appearance; if the frog is allowed to spoil under the conditions mentioned, the heels turn in, unless kept low, and the foot becomes contracted. Pick and clean the feet out once daily; if thrush is present, after cleansing the part and cutting away the diseased portion, press in burnt alum, cover with tar, or use

Bluestone	1 ounce.
Lard	1 ounce.
Tar	2 ounces.

Powder the bluestone, mix it with the lard and tar, and place over a slow fire so as to melt and thus mix the ingredients; if work has to be continued put in the alum or bluestone, cover with oakum or cotton batting, and tar. A little turpentine and sweet oil equal parts poured into the frog occasionally will tend to harden them and prevent thrush, *always give frog pressure.*

Coffin joint lameness, navicular disease, is a disease of the coffin joint, and its cartilages, which comes on slowly, usually the result of concussion, more especially if the foot is not a strong one and of good shape, shoeing with high heels, thus relieving the frog from pressure, will thus increase the chances of concussion and indirectly increase the tendency to this disease, long, hard, continual driving is a frequent cause, the endless bang on a hard road will almost invariably cause this disease, the speed has little to do with it. The pastern of an affected foot is more upright than usual, the hoof upright and concave and the heels often strong. Pointing in the stable, favoring of the limb affected, shortening of the stride,

with a stilty, stubby gait, are all symptoms of this disease; if one notices a horse affected with this disease driven on the street, which is later on stopped and tied, the animal will be noticed to paw slightly with the affected foot, in fact is really hunting a comfortable spot on which to rest the foot so as to allow the coffin joint to be flexed, he may even rest the heel on a stone. If both feet are affected the gait is very short, he paddles, stubs the toes, and if the pain is severe will lie down the greater part of the time when in the stable; as a result the muscles of the whole limb may waste, thus giving rise to the condition termed **"chest founder,"** the hoof and coronet will also be narrower than usual.

Treatment—Give rest, blister the coronet and turn on a soft pasture; if not cured get your veterinarian to put in a frog seton, and if that fails, have him nerve the animal, after which operation the feet will need daily watching and care, although enabled to work without lameness for a year or two after the operation. Have the feet pared so as to throw slightly forward on the toe, and apply a wide webbed shoe with a roll to the toe.

Pricks in shoeing are not as common as they used to be, the shoeing smiths being more careful than heretofore and as a result of the various horseshoers' associations studying the anatomy and physiology of the feet. The cause may be, driving nails too close or in the wrong direction, thus penetrating into or bearing on the quick, the lameness and pain may not show for a day or even for a couple of weeks, in the latter case pus is likely forming. Some horses have thin walled hoofs and are easily pricked; the nearer the heel the greater the dan-

ger, inside quarters being oftener pricked than outside ones. If a horse has been left shod for some months and when reshod has the foot cut down pretty well, he is apt to go lame, due to the strain thrown on the tendons and liganments or to the sole having been made too thin, thus pressing on the sensitive parts, and the animal may be thought to have been pricked. If a horse goes lame after shoeing, the nail being driven high or the point not shown; or the hammer gives a dull sound, we may suspect pricking; if blood follows the withdrawal of a nail, or if the nail is wet, due to matter (pus) we can be certain that the quick has been hurt, in some cases after paring the feet a stain may be seen around the nail hole. **The color of the matter** (pus) is often a guide as to the extent of the injury, if black, the wound is only superficial and will soon recover; a yellowish color shows pus more or less deep seated; if purple and a putrid smell the chances are that the pedal bone is affected, should great pain be shown after letting out the matter, the injury is very serious. In this form of disease the same rules apply as to other wounds, plenty of drainage so as to get the pus away must be given, hence pare the foot, steep in a hot antiseptic solution for a couple of hours, or a bath of bluestone—one ounce to a pint of water—may be given daily, for an hour; if the hoof is hard the application of a hot flaxseed poultice will be useful, before doing much paring of the foot; after paring down, baths followed by oakum and tar stoppings are to be preferred to poultices. Pricks from shoeing or from nails picked up on the street will, if not attended to, result in pus forming and working upwards to the coronet and there break

out, thus forming what is known as a **"quittor,"** it is needless to say that the treatment for this condition will have to be left to the surgeon.

Corns are bruises of the sensitive sole, usually in that portion enclosed by the inner angle of the wall and bars, usually present in the fore feet. Weak heels predispose to the disease, very strong heels may also result in this trouble due to pinching of the sole between them and the pedal bone.

The causes of corns are several, chief of which is faulty shoeing, putting pressure on parts not intended to bear it, by cutting down the bars or putting on short heeled shoes, and *especially by the common practice of leaving shoes on horses' feet for months at a time without resetting and removal of excess of horn growth.* Excessive thinning of the sole and later stepping on a stone will cause the sole bruise (corn), some weak-footed horses will have corns in spite of all methods of shoeing; barefooted horses rarely have corns.

The lameness resulting from corns gets worse as the animal is worked who may point. If the shoes are removed and the sole pared the surface will be noticed to be reddened and in some cases pus may be found, always a serious condition. Removal of the shoe, paring out of the seat of the corn and a poultice to the foot, will in cases of lameness, due to a corn, result in almost marvelous cures. Antiseptics, such as tar, should be used and a bar or three-quarter shoe should be put on, care being taken to avoid pressure on the affected parts.

Foot rot in cattle and sheep will often occur if the feet are allowed to grow too long and get fouled with manure,

or as a result of running on low-lying, wet, muddy pastures. Lameness will be excessive, the pain in some cases causing the animal to go off its feed, fall behind the flock or herd and sometimes go on its knees, in such cases trim down the feet and bathe in a bluestone solution (sulfate of copper (bluestone) 1 ounce to water 10 ounces), then apply tar to the parts, two or three applications of the bluestone solution will usually cure most cases; where large numbers need treatment the solution is made and placed in a wooden trough and the animals walked through it; the former conditions should be changed; in those cases in which sloughing has occurred butyr of antimony may be used to touch the raw spots.

A good way to treat cattle affected is to take a piece of cheesecloth soaked with the drug, after cleaning between the clefts, working back and forth and then apply pine tar on a clean piece of cheesecloth, which may be tied on the foot as follows: Take a piece of cheesecloth and split it at both ends; spread tar over the unsplit part and draw up between the claws; then bring the ends from the back around and tie to those on the front, a knot having been tied in each to prevent the split extending too far; in severe cases poultice with flaxseed, or boiled turnips; do not use cow dung or other dirty materials.

Dropped Hip is a fairly common fracture occurring in horses, sometimes seen in cattle, being in fact the breaking down of the outer point of the hip bone, the result of rushing through narrow doorways or animals crowding in such places, the careful stockman will always give his stock plenty of time to get through doorways, gateways,

etc. Owing to the action of the muscles attached, union of the parts is rare, generally a fibrous joint is the result (see Fractures) in other cases the parts do not unite and an operation has to be performed to remove the loose piece of bone. A somewhat similar deformity is that due to fracture of the point of the bone of the buttock, just below the root of the tail, to detect the lesion one has to stand to one side of the animal, and in dropped hip behind. Pain and swelling, together with lameness, and occasionally formation of pus aid in the detection of these lesions due to accident.

Stifle out (**luxation of the patella**) exists in two forms, e partial and complete: the former usually in young colts, the result of *heredity; stallions poorly muscled through the stifles get such stock:* the latter in older animals, the result of an accident. In young colts the bone will be seen to slip in and out, a clicking noise being made at each step: for such cases a mild blister repeated at two-week intervals will often aid the young patient. To avoid such cases feed well, do not keep on very hilly pastures, and avoid making the foal follow its dam during the day while working. The construction (anatomy) of the parts will aid in understanding this trouble and the means of reduction. In partial dislocations in grown horses a sharp crack of a whip will startle the nimal and the bone will fly into place, in other cases (complete dislocation) it will be necessary to place a rope around the fetlock of the affected limb, and have an assistant to draw the limb well forward, the hand being used to press the bone forward and inwards at the same time, when it will usually fly into place with a sharp

click, once in place it is best retained there by keeping the limb well forward by means of a sideline and by the use of a stifle shoe (a shoe with a piece of iron projecting in front four or five inches) on the foot of the *affected* limb. A smart blister, cantharides (spanish fly) one part to clean sweet lard six parts, applied twice, at an interval of two weeks, will assist in repairing the injury. That the animal should be rested during the treatment every sensible person will understand: treatment in these cases should be prompt.

When the lesion occurs the limb affected is stiff, nailed to the ground as it were, kept out behind the body, and if made to move is dragged with the toe down, the wall and even the front of the pastern may be on the ground, the animal moves with very great difficulty.

Spavin is the bane of horse flesh and horsemen, and while of two kinds, (*a*) bone spavin, affecting the bones of the hock, and (*b*) bog spavin, affecting the bursæ of the joint and adjacent structures, there is little difference as to the serious nature of either trouble, owing to the difficulty in curing either form of spavin.

Bone spavin (**jack**) is a disease of the bones of the hock joint, an inflammation of the articular (joint) surface, as a result of which marked lameness is usually shown, following which a bony enlargement is thrown out at the lower part of the internal side of the hock joint: the result of this disease is often stiffening of the joint. The more serious bone spavins are those affecting the upper row of hock bones, situated towards the front of the joint, and affecting animals over six years old. Coarse hocks may exist, and if no lameness and both are alike should not be condemned. The causes of spavin are bad con-

formation, sprains, excessive work of the hind limbs, result of jumping, high school work, tying in below the hocks; this disease is sometimes seen in cattle and sheep.

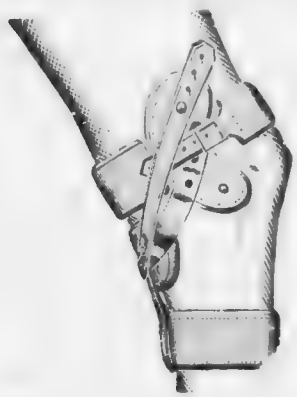
Spavin is in many cases easily detected, due to the enlargement, being accompanied by lameness, which is characterized by a shortening of the stride, dragging of the toe, which is unnaturally worn as a consequence, lameness, which the horse will warm out of, but if stood up for twelve to twenty-four hours will show quite markedly, if recent there may be heat of the parts and no enlargement, in fact in that form known as **occult** (hidden) spavin no enlargement is shown at all.

BONE SPAVIN ON HOCK OF OFF LEG.

Examination of the hocks. To detect the enlargement the examiner should stand in front and a little to the outside of the foreleg of the same side as the hock to be examined, the hock should present a somewhat wedge-shaped appearance, the base being upwards, by placing one's self in a similar position by the other fore leg the other hock is seen and a comparison made, the only safe way to detect the enlargement; if suspected the examiner

may flex (close the joint) the hock up tightly and have the animal trotted off quickly, which, if affected, will limp perceptibly. The hocks should also be felt with the hands, the off hock with the left palm, etc. The treatment is preventive and curative, the former by *avoiding the use of spavined sires or dams*, by proper shoeing and avoidance of too heavy loads; the curative consists in reducing the inflammation by giving rest, warm fomentations, a high-heeled shoe, and a blister (the red iodide of mercury), and if that fails the firing iron and blister, which should be left to the veterinarian. **It is an unsoundness.** In some cases in which firing does not relieve, tibial neurectomy (cutting of the nerve) or cuneau tenotomy (cutting of the tendon) of the parts should be performed by the surgeon.

Bog spavin is a condition in which the capsular ligament of the hock joint is distended by joint oil (synovia), appearing as a soft swelling on the inner sides of the hock, just above the site of bone spavin. This disease occurs in two forms, (**1**) without any inflammation or lameness; (**2**) a hard, painful swelling with accompanying lameness. The causes are premature overwork; *defective conformation, due to heredity;* the swelling being soft and cool, it may be due to overfeeding, such as for show purposes, in such cases cold water compresses and a good hand rubbing for 20 to 30 minutes before taking before the judges will often remove the



BOG SPAVIN AND THOROUGH-PIN TRUSS.

enlargement for a short time; treatment is usually unsatisfactory, pressure by the use of a bog spavin and thoroughpin truss being the best.

Thoroughpin is rarely absent when bog spavin exists, and is due to the pressure of the fluid constituting the bog spavin on the bursæ of the perforans tendon, which is thus pushed out of place. This lesion appears as a swelling at the back part of the hind leg, just above the point of the hock and in front of the hamstring, it can be pressed from side to side with the finger. the treatment is the same as for bog spavin. In draft stallions may be due to a sprain of the tendons, a serious condition.

BAD (CURBY) HIND LEGS.
c, a curb.

Curb is an enlargement (a bowing out) at the back part of the hock, about six to eight inches below its point, usually it is described as a sprain of the ligaments at the back of the hock, quite often the bones of the part are affected also, the enlargement being due in many cases to the pushing outward of the ligament by the inflamed bone. To detect the enlargement it is often necessary to stand to one side of the hock and then to the other so as to

see the back line of the leg in profile. The causes of this trouble are many, jumping and slipping, going up steep inclines, and more especially conformation, the result of heredity. Horsemen often speak of curby (sickle) hocks, *such a conformation is especially liable to curb*, and is *readily transmitted* to *the progeny* by *an affected sire*. The leverage exerted in connection with the hock joint is very powerful, the ground being the fulcrum; the weight, the resistance of the head of the lower thigh bone; the power, the muscles of the gaskin (lower thigh) attached to the point of the hock. The tendency to curb will be increased by (1) work too severe for the strength of the lever, (2) by disease or *immaturity* having rendered the parts unequal to the strain, (3) by the surface for attachment of the ligaments being too small, a tied-in hock, (4) by the muscles of the gaskin being very strong, (5) by the presence of a large angle formed by the direction of the weight and lever, as in the sickle hock. It is an unsoundness and *a very bad defect in stallions;* is probably commoner in light than heavy horses; lameness is shown in the earlier stages as a rule. The application of a high-heeled shoe and the red mercurial blister (biniodide of mercury 1 to 4 of lard) will generally overcome the trouble; if the lameness and enlargement persist, the veterinarian should be asked to fire the parts.

Stringhalt is a disease of a tendon of the hind limb, it used to be classed as a purely nervous affection. The affected parts (tendons) undergo severe contractions as a result of inflammation of those tendons. The exaggerated flexing of the hock, more quickly than natural, and high lifting of the foot seen when the animal is

backed or moved forward, render the recognition of this disease quite plain: the treatment is surgical, and consists in cutting the tendon (peronens) a short distance below the hock.

Shoeboil (**capped elbow**) is situated at the point of the elbow, the result of too narrow stalls, lack of bedding or pressure of the heels of the shoe when lying down; to prevent it the heel should be padded, or a piece of 2″ by 2″ stuff nailed crosswise in the stall, about half way back. This trouble usually calls for the intervention of the surgeon before being finally cured; if it is well fomented with warm water in the early stages and the following liniment applied,

Soap liniment..... ½ pint.
Strong spirits of ammonia..... ½ dracham,

every day for two weeks, being well rubbed in, the more serious blemish may be avoided.

Capped hock occurs in two forms, that due to enlargement of the joint oil sac (bursæ) of the part, and the less serious form, the cyst formed between the tendon and the skin, usually the result of injury, such as kicking in the stable. When the inflammation is overcome it may be blistered occasionally; grooms favor a paste of vinegar and fuller's earth applied over the parts when in the stable.

CHAPTER XX.

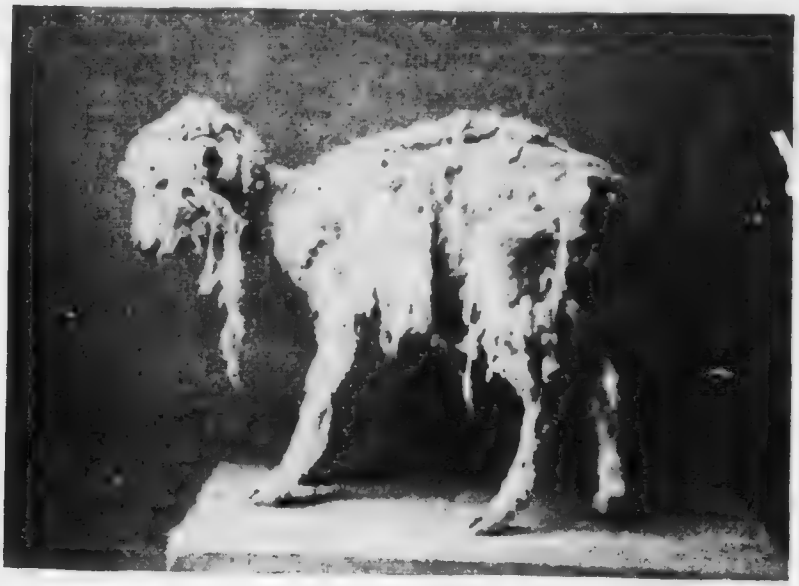
EXTERNAL AND INTERNAL PARASITES OF ANIMALS.

Parasitic troubles are numerous among the stockman's charges, and are in many cases hard to overcome. horses, sheep and poultry seem to be more commonly affected than cattle and pigs. In order to render the study of these parasites easier, they will be classified into (A) external, (B) internal.

(A). External parasites cause such diseases as scab in sheep, mange in horses and dogs, lice of all farmstock, including poultry, the warbles of cattle, ringworm of cattle and grease of horses.

Scab is a disease of sheep, caused by one of the mange parasites (sarcoptes ovis), and is transmitted by contact from one sheep to the other. Range sheep are more commonly affected than those kept on the farms, although the recent laws and systematic dippings are tending to stamp it out. Sheep affected with this disease do not thrive, they are continually rubbing themselves, due to the itching caused by the parasite (scabmite), the wool falls out, leaving large, bare, raw spots, and often formation of scabs and tagging of the wool, later the skin becomes furrowed and thickened and bleeds from the cracks. The best treatment is preventive in character. Dip all sheep before putting with the flock; affected sheep should be kept from healthy sheep, and dipped a

couple of times at two-week intervals; the various dips on the market, such as Cooper's, Little's, etc., are reliable.



A CASE OF SCAB.

Mange in horses and dogs is not easy to control; in horses it affects the mane and tail; spreading to the jaws, body and thighs, there is great itchiness and a tendency to rub, pimples form and discharge a serum and bare spots appear; the skin gets a roughened sore appearance, it usually takes one to two months to develop, and is very contagious, the latter symptoms distinguishing it from eczema. In order to get at the parasites, the hair should be clipped and the clippings burned, the animal should be washed with soap and warm water to a quart of which should be added a tablespoonful of concentrated

lye or washing soda, using a stiff brush to apply the suds; creolin one ounce to the pint of water, or sulfur one to lard eight parts should be well rubbed in daily after the first washing. All harness should be cleansed, currycombs and brushes immersed for a few minutes in boiling water, and the bedding burned if these articles have been used for mangy animals. Hot carbolic lime wash sprayed over the stalls will also be beneficial. That form of manginess affecting the limbs of hairy legged horses commonly termed grease, is also hard to overcome, the same general treatment should be given, for the local application after the washing, the sulfur-kerosene mixture so much used by heavy horsemen will be found very penetrating and consequently very beneficial. In this form the mange mites commence at the back of the pastern and work up to the knee or hock, affecting the hind limbs generally: there is great itchiness, the horses bite and rub their fetlocks, and often are heard to strike the ground frequently with the foot. Cracks, crusts and thickening of the skin result from this disease. A form of this disease known as scaly legs occurs in poultry, in which cases the legs are swelled and roughened in appearance, due to the standing out of the scales, washing with warm soapsuds and the application of creolin, kerosene, being careful with the latter, or hen oil (Tilson) a few times will overcome the trouble.

Lice infest all varieties of farm stock, and make their presence known by the excessive itchiness shown by the stock and the appearance of the parasites and their eggs (nits). The treatment will vary with the animals, if sheep or pigs are affected, the former with a red louse,

dip as for scab, using such materials as creolin, germol, chloronaphtholeum, etc., and repeat the dipping in two week's time, thus allowing time for the nits to hatch out, when the new lice can be destroyed; ticks of sheep need the same treatment, usually given by the best shepherds shortly after shearing. Cattle need the application of creolin and water (one to twenty), melted lard and kerosene (two to one) or the kerosene emulsion made as follows:

One-half pound hard soap and one gallon of water, boil until the soap is dissolved, then add two gallons of kerosene (coal oil) and mix thoroughly; when about to use take one part of the emulsion to four to eight parts of the water; in place of the hard soap, whale oil soap or one quart of soft soap may be used.

Ringworm is a contagious disease due to a fungus found on man, horses and cattle; it often dies out of its own accord. This disease, as the name implies, shows itself by bare ring-shaped patches, in which the hairs are seen to be broken off close to the skin, on some spots the hairs are split at the ends or are dead. The parasite often affects the skin around the eyes of cattle, and in some cases will spread over the neck or on parts of the body. The affected parts should be well washed with soapsuds, using a brush to remove any of the dead skin scales, then follow with one of the following ointments, one being as useful as the other:

Salicylic acid..... 1 part,
Clean sweet lard..... 6 parts,

or

Iodide of sulfur..... 1 part,
Lard..... 8 parts,

which should be applied once or twice daily for a week, being applied by rubbing well in with the fingers; as the disease is contagious the harness, combs, brushes, etc., should be disinfected as recommended for mange. Affected animals should be given good food and tonics.

Maggots in animals are generally found on wounds, and often on sheep that are left untagged, is really induced by uncleanliness; summer time is the period when the pests are to be found, hence the reason for the avoidance of such operations as dehorning during the summer months; as soon as fly time begins, maggots, which are the larvæ of flies, being hatched from their eggs, should be looked for. The treatment is cleanliness, frequent tagging (cutting off the pieces of wool soiled with the urine or feces) of sheep, and the occasional application of creolin, or some other antiseptic.

Grub in the head is a disease affecting sheep, due to the sheep gadfly laying its eggs in the nostrils of the sheep, which eggs eventually hatch out the larvæ or grub, causes sneezing and discharge of mucus from the nostrils and by the irritation set up in the nasal cavities may cause death. Preventive measures are the most satisfactory to adopt, tarring the nostrils being as good as any; for a flock, it is recommended to bore two inch auger holes in a log, place salt in the bottom and smear the edges with the tar, the sheep in their desire for salt will in this way apply the tar themselves, further treatment is surgical and not practicable for general flock management. Sheep seem to know intuitively the result of the attacks of this gadfly and will try to bury their noses in the earth to avoid its attack

The horn fly of cattle is very common in some seasons, it is a little black fly, often found in clusters around the horn base, for its prevention bi-weekly applications of fish oil containing carbolic acid, one ounce to the gallon of oil and applied along the back and around the horns. Its effects are too well known to need description. The use of this mixture will also tend to keep off the *warble fly*, the effects of which are seen in the warbles found on the backs of cattle, when removed the warble (larvæ of the fly) should be at once destroyed. Hides are often materially injured owing to attacks of this fly during the life of the animal. Four ounces of flowers of sulphur, one gill spirits of tar, train oil one quart, mixed and applied along the spine once a week will tend to prevent the ravages of this fly.

Poultry lice cause intense itching and loss of condition in the host, and should not be permitted to exist in any up to-date poultry house. Cases are cited in which animals (horses, etc.,) have become affected when the poultry roosted with them. The removal of the poultry and the use of insect powder if in winter or the creolin lotion in summer, together with the plentiful use of kerosene or hot lime wash, will overcome the trouble; use sulfur lavishly or insect powder in the nests. Hen houses should be thoroughly treated twice yearly with hot lime wash, the roosts and nests being plentifully dowsed with kerosene.

Summer sores in horses are said to be parasitic in their nature, in India being termed *bursattee*. The disease is shown by sores on the skin, at the fetlock, sheath, face, lips and front of the chest: at the beginning the sores are

red and unhealthy looking, sometimes nearly a foot in diameter, are often kept moist by the discharge, in the sores are often found little pea-shaped hard yellowish bodies; the sores heal of their own accord in cold weather. In accordance with the idea of parasitic origin, strong antiseptics should be used, carbolic acid full strength, later paint on camphor one part to carbolic acid, two and one-half parts. The application of one of the following after the sore begins to look healthy will be all that is needed, in addition to preventing any irritation:

Carbolic acid..... 1 ounce,
Resin..... 1 ounce,
Camphor..... 5 ounces,
Methylated spirits.....15 ounces,

or

Iodoform..... 1 dram,
Oil of eucalyptus..... 1 ounce.

Keep the sore covered with the drugs until healed.

INTERNAL PARASITES.

Bots are the larvæ of gad-flies which lay their orange-colored eggs on the legs and between the jaws of horses, the eggs are licked off or fall into the feed and are thus swallowed by the horse, where they are hatched out in the stomach, where the larvæ (bot) will stay for months, later on being passed out in the dung to be hatched out as the gadfly, so well known to horsemen and so much dreaded by their charges. It is doubtful if any horses in this country are free from bots, postmortems invaria-

bly showing them to be present in varying numbers. The preventive treatment is to destroy the eggs. A cloth dampened with kerosene will tend to remove them. The effect of bots depends on the number present, if few no ill effects are noticed, but if many, the horse is unthrifty, suffers from indigestion and may die from their effects on the stomach walls; they are fastened on the stomach walls very firmly and it is doubtful whether medicines have much effect, turpentine two ounces in one and one-half pints of new milk three mornings in succession, given on an empty stomach, will probably be as effectual as any drug. Copperas powders, owing to their tonic and astringent effect on the mucous membranes will also be beneficial; tartar emetic two drams in the food daily for two weeks might be used in place of the drench.

Pin worms are small thin whip-like worms one to one and a half inches long, found in the posterior bowel (rectum), while producing little disturbance of the general health, they manifest themselves as a rule by a yellow waxy matter around the anus and by rubbing of the tail and hind parts, the worms may also be found in or passed with the excrement. The treatment is mainly local, by means of injections, first give an injection to clean out the bowel, and follow it with one of salt and water, one ounce of salt to one-half gallon of water; or a decoction of quassia chips may be used, if the injections fail to remove them, internal treatment will be needed.

Round worms are the larger kind usually found in horses, and when full grown are six to fourteen inches in length; they usually inhabit the small intestines; when

many are present the animal loses condition, gets pot-bellied, has a rough coat, capricious appetite, shows a tendency to eat dirt, with occasionally a colic or diarrhœa, and presence of worms in the dung. The riddance

STOMACH OF A HORSE.
G.—The gullet (esophagus).

of a horse of these parasites is not very difficult if a thorough effort is made to dislodge them, in order to get the best effects the animal should be starved before giving the drugs, which may be as follows:

Tartar emetic..... ½ drachm,
Copperas..... ½ drachm,

mixed and given in the feed three times a day, followed by a dose of aloes, or:

Turpentine two ounces, new milk one pint, given three successive mornings on an empty stomach, the fourth morning give Tartar emetic two drachms in a pint of raw linseed oil, if the horse has to be worked steadily the following powders will be useful:

Powdered copperas..... 1 ounce,
Powdered bluestone..... 1 ounce,
Powdered sugar..... 2 ounces,

mix and make into twelve powders, one to be given twice daily in the feed.

Worms are not common in cattle; in sheep are the frequent cause of losses and occasionally so in pigs.

Stomach worms, usually found in lambs, are the most serious and most common, they are very small, one-quarter to one-third of an inch long, pale reddish in color, being found in the fourth stomach only. Lambs affected are thirsty, pale in the eyes, lose weight, are dull, lose their appetite, may scour or eat dirt. Benzine or gasoline two to four drachms in six ounces of new milk, given three mornings in succession on an empty stomach, have been highly recommended; creolin and milk, in similar doses may also be used. Worm powders for sheep should be mixed with plenty of salt and placed in the salt troughs.

Tape worms when present cause symptoms similar to those described for stomach worms, in addition, paleness of the skin and mucous membrane, brittleness of the fleece, loss of flesh, voracious appetite, pieces of the tape

worm in the dung; they are more prevalent in wet seasons and on damp pastures.

Turpentine in raw milk, a decoction of pumpkin seeds, are old and tried remedies; santonine, as much as will lie on a five-cent piece, or tannate of pelletierine three to five grains, are new remedies recommended. The best preventive treatment is to change the pastures and crop the old ones for a few years.

A long worm is sometimes found in the intestines of pigs, unless in considerable numbers they seldom cause much trouble, if suspected give turpentine in milk or oil, or oil of wormseed.

CHAPTER XXI.

CONTAGIOUS DISEASES AND THEIR SUPPRESSION.

Diseases of germ origin have become of great importance to the stock raiser in recent years and are more easily controlled than formerly, owing to the work of bacteriologists and veterinarians. Hygiene, which means pure food, good water, pure air, sunshine and cleanliness, prevent the harboring of germs and thus limit or prevent their propagation.

Tuberculosis, commonly termed consumption, is quite prevalent in the human race and in cattle is not at all uncommon. The cause of the disease is the *bacillus tuberculosis*, discovered by Koch in 1882. Heredity is only a predisposing cause, as are lack of pure air, innutritious food, lack of sunlight, as in dark basement barns, etc. The disease is not easily discovered in the early stages without the aid of the tuberculin test, which is a very reliable method when in the hands of competent men, and is entirely without danger to the animal tested; in the later stages of this serious trouble the disease is evidenced by a frequent cough, general ill-health, shown by the staring coat, capricious appetite, and sometimes a stinking diarrhœa. Treatment in the usual sense of the term is not practicable; but the progress of the disease in a herd may be arrested by culling out the diseased cattle at least once a year by means of the tuberculin test, separating the healthy from the unhealthy, and

raising the calves from the diseased cattle, removing them as soon as dropped, however, from the dams, this being known as the Bang method.[1] *Slaughter, based only on* the results of the tuberculin test, is an insane and expensive method of extermination of this pest, recommended by some bacteriologists and veterinarians; it is

GIVING THE TUBERCULIN TEST.

time enough to slaughter when the animals shown to be affected by the tuberculin test also show clinical symptoms, as mentioned above. *Sunlight, pure air, good food and tonics,* oil meal, etc., will all *aid in keeping animals in good health,* in which condition they are practically more or less impregnable to the germ. It is a good plan to test with tuberculin all animals brought into the herd.

[1] Bang is a noted veterinary professor at Copenhagen.

especially if the herd is made up of pure-bred stock. The tuberculin test, it should be remembered, is not infallible. Thorough *disinfection of stables should never be neglected* when tuberculosis has made its appearance; the fact of its *contagious* nature must *never* be forgotten; the probable danger to human beings can best be limited by the tuberculin test followed by Bang's method, pasteurization of milk and thorough meat inspection. Prof. Koch (Berlin) has recently stated that human tuberculosis *cannot* be communicated to cattle, and while not *fully proven*, is of the opinion that tuberculosis cannot be given by cattle to the human being; he asserts the great danger lies in infection by the sputum of man; be it all as he states *tuberculous* cattle are *not* as good property as non-tuberculous cattle.

Glanders and Farcy hold a somewhat similar position to horses that tuberculosis does to cattle, although not as common as that disease, yet is quite contagious, and in the early stages hard to detect, in which case the use of the mallein test is useful to detect the earliest inroads of the glanders germ, the bacillus mallei. This disease is transmissible to man, in whom it manifests itself by loathsome symptoms. The symptoms, when the disease is far enough advanced, in horses are as follows: A discharge from one or both nostrils, usually from the left one, of a sticky, green, gluey nature, with a discharge from the eyes and enlargement of the submaxillary gland found beneath the jaws; in the local form, termed Farcy, little lumps form on the limbs and body, which eventually break and discharge pus. Treatment of this disease is not advisable, in fact under the contagious diseases acts

of various states, slaughter is called for, and is the best means so far of controlling the disease.

Black-leg or quarter ill is a rather common disease affecting young cattle, being of undoubted germ origin, but fortunately, owing to the scientists, can be controlled in a herd. This disease appears somewhat suddenly, its presence being made known by death of the young cattle between six months and two years of age, especially during the months of June, July and August. Crackling swellings on the skin of the body, thighs, neck, shoulders, etc., and limbs above the knees and hocks, which swellings are at first small and painful, later becoming cold and insensible, together with fever, loss of appetite, and stoppage of rumination are all signs of this disease. The swellings give out a crackling sound when the hand is passed over them, if an incision is made into them a dark red, frothy, nasty smelling fluid flows from the wound. The germ obtains entrance through wounds in the skin, taking from one to five days to develop. The germ retains its vitality and contagious character for months, fire being its surest destroyer. The most satisfactory treatment is that of a preventive nature, obtained by the use of Blackleg vaccine or blacklegine, which can be got from any druggist. All dead bodies of cattle affected with this disease should be burned.

Hog cholera and swine plague may be considered, for all practical purposes, as one disease, differing only in locality, the first named attacking the intestines of hogs; the second the lungs of those animals. The disease is very contagious and fatal to hogs. The onset of the disease may last from a few hours to several weeks.

Hogs affected droop and cough, lose their appetite and flesh rapidly, are very weak, may show diarrhœa or constipation with pink spots over the abdomen or thighs. The bowels are often found to be ulcerated and the lungs inflamed on post-mortem. Treatment so far has *not* been successful, though numerous quack remedies are advertised to cure the trouble; preventive inoculation is not yet a success, the Bureau of Animal Industry recommends the following mixture to be given in the feed, one teaspoonful to each hog:

Charcoal	1 lb.
Sulphur	1 lb.
Common salt	2 lbs.
Baking soda	2 lbs.
Sulphate of soda	2 lbs.
Hyposulphite of soda	2 lbs.
Black antimony	1 lb.

If the disease appears in a drove of hogs, separate the sick from the well, and ship the latter to market; disinfect the pens thoroughly, using plenty of lime, destroy all the bedding used with fire. *Quarantine all new hogs for fifteen days before placing with the drove;* do *not* allow persons from infected farms to go into the pig pens or yards.

Tetanus, or lockjaw, as it is commonly known, is more common in cities than in the country; it might be described as a state of continued contraction of voluntary muscles (those under control of the will). This disease is due to germs which usually get into the animal by a wound, once in that wound these germs produce powerful poisons, the results of which are shown in animals by

the following symptoms: Inability to open the mouth as wide as normal, the nose poked out, the head slightly elevated, the tail may be raised, the animal is very stiff in its movements; if the head is suddenly lifted or the animal frightened the haw will be seen to fly over the eye, a safe indication of this disease; the nostrils are dilated, breathing quickened and the belly tucked up. The animal gets constipated and often its mouth gets foul, due to retention of food in it. Death usually occurs from spasms of the chest muscles or those of the larynx. The period of incubation (time elapsing between the attack by the germ and symptoms of the disease) is usually from three to ten days; recovery is rare before the third week, often five to six weeks are necessary before convalescence begins; the sooner symptoms are shown the more fatal the disease. The germ of this disease is found in earth and decaying matter, hence as this *disease* is *one* of *wound infection*, it is readily seen how important *cleanliness* and the use of *antiseptics* are in the treatment of all wounds. The treatment of this disease calls for the most skilled veterinary attention, the stockman doing his part by keeping the animal perfectly quiet and free from annoyance by visitors, the stall well bedded, a supply of nourishing food on hand and watching to see that the animal does not get down and struggle. This disease may follow castration, docking, wounds of the feet, even such as overreaches, etc., and the use of unclean instruments. The anti-tetanic serum is being used in this disease; so far it shows greater value as a preventive than as a curative agent.

Texas fever is a disease of the Southern states affecting cattle, the poison (virus) of the disease being carried

by a tick. The disease shows itself in cattle by fever, bloody urine, dropsy, deficiency of blood, loss of appetite, stoppage of milk secretion and rumination, rapid wasting and death; post-mortems show the spleen enlarged, as is the liver. The only effective treatment is of the preventive character, by inoculation with the blood serum of an affected animal. (Francis and Connoway).

Anthrax is a rapidly fatal disease of cattle and other animals, the result of the inroads of the anthrax germ. The suddenness of attack, ending in death in from a few hours to a few days, high fever, congestion of mucous membranes, bloody discharges from natural openings of the body, signs of brain congestion, such as excitement, bellowing, convulsions, stupor, and death; difficult, rapid breathing, and as previous symptoms indigestion, constipation, diminished vivacity. The *treatment* is entirely of the *preventive* order, the use of *anthrax vaccine.* Burn all carcasses or sprinkle with quicklime, handle as little as possible, as this disease is more or less deadly to the human being, hence one should never hold a post-mortem on such a case, neither should the animal be skinned; tanners and wool sorters sometimes become infected with this disease through hides and fleeces.

Lumpy jaw (**actinomycosis**) is due to the invasion of the tissues by the ray fungus. This disease is quite common in cattle, usually showing itself in those animals by enlargements of the lower jaw, in the early stages the lumps are quite movable, later on the jaw bone becomes affected; occasionally the upper jaw is affected or the tumors are found on the skin of the head and neck; may